CANADA

DEPARTMENT OF FORESTRY

ANNUAL REPORT

of the

FOREST INSECT AND DISEASE SURVEY

FOREST ENTOMOLOGY AND
PATHOLOGY BRANCH

1960

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Published on the Authority of the Hon. Hugh John Flemming
Minister of Forestry · Ottawa, Canada

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ROGER DUHAMEL, F.R.S.C.
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FOREWORD

In 1960, the Forest Insect Survey marked its twenty-fifth year of operation. It has grown from a small organization centred at Ottawa and Fredericton, primarily concerned with the spread of the European spruce sawfly, into a Canada-wide organization of more than 100 year-round employees working from 11 well-equipped laboratories. In 1951, the Forest Disease Survey was initiated to broaden the coverage of forest and tree damage. Coincident with this anniversary has been a major re-organization of forestry agencies within the Federal Government. A Department of Forestry was formed late in 1960 and includes the former Forest Biology Division of the Department of Agriculture under whose aegis the Survey was originally organized and operated. The Survey will continue in its present objectives within the new Department and perhaps find additional opportunities to contribute to the broadened research program. Existing co-operative arrangements with the Entomology Research Institute and the Plant Research Institute of the Research Branch, Department of Agriculture, will continue in respect to insect and fungus determinations, and to taxonomic problems and research generally. The interest and co-operation of the personnel concerned is very much appreciated as their efforts are indispensible to Survey operations.

A number of staff and organizational changes occurred during 1960. At Calgary, Mr. Baranyay joined the Disease Survey staff and Mr. R. E. Stevenson replaced Mrs. M. E. P. Hopkins on the Insect Survey staff. The major change was the recognition of the need for additional assistance at Divisional Headquarters where adequate attention to national projects and to the general co-ordination of Survey activities and developments has not been possible. This led to the appointment of Mr. R. M. Prentice, previously officer-in-charge of Survey activities at the Winnipeg Laboratory, to the post of Survey Coordinator. These duties were assumed early in 1961 and Mr. Prentice will be immediately responsible for the integration and editing of future issues of this Report.

Further improvements were made to laboratory and field facilities in 1960. In Newfoundland, ranger field headquarters were established at Badger and Clarenville and the newly completed laboratory facilities at Corner Brook proved their value during the 1960 field season which augurs well for the improved rearing facilities planned for other locations. A new ranger field headquarters was established at Grande Prairie, Alberta, and major improvements were made to existing field headquarters at a number of other points in Canada.

From the east coast to the Interior of British Columbia, weather conditions during 1960 were typified by an early moderate spring followed by a hot dry summer. In terms of tree vigour and damage, there were only occasional reports of frost damage, foliage diseases were conspicuously absent, and leaf scorch, twig mortality, and other heat and drought symptoms were very common. Only in coastal British Columbia were weather conditions conducive to foliage diseases and three in particular were unusually commonplace and severe, namely, Douglas-fir needle blight, yellow pine blight, and larch needle cast. Also in British Columbia, two new rust introductions were reported and the presence of willow blight was reconfirmed. In eastern Canada, the Dutch elm disease continued to attract considerable attention. Northward extensions of its known distribution were recorded in south-central Ontario and in New Brunswick.

The forest insect conditions reported in the regional contributions that follow deal with a wide variety of circumstances. As usual, the spruce budworm,

larch sawfly, and forest tent caterpillar were reported from all regions and brief national summaries appear below. However, major changes in the abundance of other insect pests are also noteworthy. Marked increases were reported for the balsam woolly aphid in Newfoundland; hemlock loopers were numerous in Cape Breton Island for the first time in many years; the balsam-fir sawfly was unusually abundant in southern and eastern Manitoba; counts showed increased numbers of the lodgepole needle miner in Alberta but it still remains at a relatively low level; and defoliators generally were conspicuous in the coastal areas of British Columbia where several control operations are proposed for 1961. Fortunately, a number of forest insect pests declined in abundance during 1960. Some of the more noteworthy were: balsam gall midge numbers were down in the Maritime Provinces after four or five years of severe infestations that caused concern to Christmas tree exporters; the Bruce spanworm and associated leaf rollers that have been so conspicuous in Alberta for several years were quite rare; defoliators generally were much reduced in numbers in the Interior of British Columbia; and the black-headed budworm outbreaks in coastal British Columbia declined, partly from natural causes and partly from a control operation in the Queen Charlotte Islands. A host of other insect pests continued to affect forest stands, woodlots, plantations, shelterbelts, and ornamental trees and shrubs. These conditions are dealt with at length in the regional contributions that follow.

The spruce budworm continued as a major problem in most regions with only modest changes from conditions in 1959. In Newfoundland, greater numbers were received in collections but no outbreaks were reported. In Prince Edward Island and Nova Scotia, numbers were reduced except for one restricted area in Cape Breton Island. Aerial spray operations were renewed in central New Brunswick and will probably be repeated in 1961. No increase in abundance has been noted in northern New Brunswick and the Gaspe region of Quebec except for two very small areas in the Gaspe. Conditions in the rest of Quebec are not known. There were marked reductions in the older western portions and slight extensions in the eastern portions of the large-scale outbreak in northwestern Ontario and adjacent Manitoba. The Namew Lake outbreak on the Manitoba–Saskatchewan border continued and extended farther east and north. Several restricted outbreaks in Alberta continued while the infestation along the Mac-Kenzie River in the Northwest Territories increased in severity. Spruce budworm conditions in British Columbia were overshadowed by developments in the extensive two-year-cycle outbreak in the Prince Rupert and Prince George districts. This outbreak continued at a very high population level and is causing considerable defoliation of spruce and alpine fir over an area now approaching 8 million acres. Top kill and mortality, particularly of understory trees, has been reported for some of the more heavily damaged areas.

The larch sawfly was again in outbreak proportions from Newfoundland to northeastern British Columbia. Conditions were quite variable even over relatively short distances but most of the major changes from 1959 were either increases in intensity or area involved. Some of the more significant were in New Brunswick, eastern Quebec, and northern Manitoba and Saskatchewan.

In recent years, there has been a steady increase in the number, extent, and severity of forest tent caterpillar outbreaks. This trend continued in 1960 and it is apparent that a period of general abundance is rapidly approaching. The first indications were in Alberta a few years ago, followed closely by Manitoba and Saskatchewan. In 1960, areas of severe defoliation were common and forest tent caterpillars could be collected in aspen stands throughout most of the Prairie Provinces. Increased numbers and several small infestations were reported in Ontario in 1960 while in the Maritime Provinces, light traps and general collections showed marked increases from the small number of specimens collected in recent years.

In addition to this national report and the more detailed regional and district reports of insect and disease conditions that are prepared each year for general distribution, a wide variety of articles by Survey officers or of a survey nature are published in scientific journals and in the Bi-Monthly Progress Report of the Forest Biology Division. Those published during 1960 are listed below and copies may be obtained from the undersigned or from regional laboratories.

Béique, R. The importance of the European pine shoot moth, *Rhyacionia buoliana* (Schiff.) in Quebec city and vicinity. Can. Ent. 92:858–862. 1960.

Blais, J. R. and R. Martineau. A recent spruce budworm outbreak in the lower St. Lawrence and Gaspé Peninsula with reference to aerial spraying operations. For. Chron. 36:209–224. 1960.

Bloomberg, W. J. and A. Funk. Willow blight in British Columbia. Bi-Monthly Progress Report 16(5). 1960.

Bouchard, P. Observations biologiques sur la tenthrède limace, *Caliroa cerasi* (L.). 41• Rapport Soc. Qué. Prot. Pl. (1959):101–115. 1960.

Boyer, M. G. Observations on foliage diseases of introduced poplars. Bi-Monthly Progress Report 16 (2). 1960.

Bracken, D. F. and R. Martineau. A new outbreak of the larch sawfly in Quebec. Bi-Monthly Progress Report 16 (6). 1960.

Carroll, W. J. and D. G. Bryant. A review of the balsam woolly aphid in Newfoundland. For. Chron. 36:278–290. 1960.

Cayford, J. H., V. Hildahl, L. D. Nairn, and M. P. H. Wheaton. Injury to trees from winter drying and frost in Manitoba and Saskatchewan in 1958. For. Chron. 35:282–290. 1959.

Eidt, D. C. An unusual nursery pest. Bi-Monthly Progress Report 16(3). 1960.

Eidt, D. C. The morphology of the larch moth, *Argyresthia laricella* Kft., and comparisons with *A. laevigatella* H.-S. Can. Ent. 93:24–32. 1960.

Eidt, D. C. and W. L. Sippell. The life history, parasites, and economic status of the larch shoot moth, *Argyresthia laricella* Kft., and comparisons with *A. laevigatella* H.-S. Can. Ent. 93:7–24. 1960.

Evans, D. A revision of the genus *Enypia* (Lepidoptera:Geometridae). Ann. Ent. Soc. Amer. 53:560–574. 1960.

Harris, J. W. E. The balsam woolly aphid, *Adelges piceae* (Ratz.), in British Columbia, 1959. Bi-Monthly Progress Report 16 (2). 1960.

Hopkins, M. Notes on *Hyalophora* spp. from the Forest Insect Survey, Calgary. Bi-Monthly Progress Report 16 (3). 1960.

Kusch, D. S. A method for describing larvae in the insectary. Bi-Monthly Progress Report 16 (1). 1960.

Lindquist, O. H. Two leaf-miners on red oak and white birch in Ontario. Bi-Monthly Progress Report 16 (4). 1960.

Martin, J. L. The bionomics of *Profenusa thomsoni* (Konow) a leaf-mining sawfly on *Betula* spp. Can. Ent. 92:376–384. 1960.

Martin, J. L. Life history of the pine tip moth, *Rhyacionia adana* Heinrich, in Ontario. Can. Ent. 92:724–728. 1960.

Martin, J. L. Chemical control of *Rhyacionia adana* Heinrich. Bi-Monthly Progress Report 16 (1). 1960.

Melvin, J. C. E. Insects attacking wild rice in Manitoba. Bi-Monthly Progress Report 16 (4). 1960.

Molnar, A. C. and R. G. McMinn. The origin of basal scars in the British Columbia interior pine. For. Chron. 36:50–60. 1960.

Nairn, L. D. and R. M. Prentice. Infestation ratings of the larch sawfly in Manitoba and Saskatchewan. For. Chron. 36:225–229. 1960.

Ouellette, G. B. and C. Gagnon. Formation of microendospores in *Ceratocystis ulmi* (Buism.) C. Moreau. Can. J. Bot. 38:235–241. 1960.

Reeks, W. A. Observations on the life history, distribution, and abundance of two species of *Cecidomyia* on jack pine in Manitoba and Saskatchewan. Can. Ent. 92:154–160.1960.

Ross, D. A. Damage by long-horned wood borers in fire-killed white spruce, central British Columbia. For. Chron. 36:355–361. 1960.

Saksena, H. K. and O. Vaartaja. Descriptions of new species of *Rhizoctonia*. Can. J. Bot. 38:931–943. 1960.

Silver, G. T. A new black-headed budworm infestation in the Queen Charlotte Islands, British Columbia. Bi-Monthly Progress Report 16 (2). 1960.

Silver, G. T. The relation of weather to population trends of the black-headed budworm *Acleris variana* (Fern.). Can. Ent. 92:401–410. 1960.

Silver, G. T. Notes on a spruce budworm infestation in British Columbia. For. Chron. 36:362–374. 1960.

Sugden, B. A. and D. A. Ross. *Ips oregoni* (Eich.) in ponderosa pine, Interior British Columbia. Bi-Monthly Progress Report 16 (3). 1960.

Thomas, G. P., D. E. Etheridge, and G. Paul. Fungi and decay in aspen and balsam poplar in the boreal forest region, Alberta. Can. J. Bot. 38:459–466. 1960.

Underwood, G. R. Parasites of the red-pine sawfly. Bi-Monthly Progress Report 16 (1). 1960.

Watson, W. Y. Two new species of the genus *Hyperaspis* (Coleoptera:Coccinellidae). Can. Ent. 92:230–234. 1960.

Watson, W. Y., G. R. Underwood, and J. Reid. Notes on *Matsucoccus macrocicatrices* Richards and its association with *Septobasidium pinicola* Snell in eastern Canada. Can. Ent. 92:662–667. 1960.

Wong, H. R. Preliminary notes on the life history of *Herculia thymetusalis* Wlk. Bi-Monthly Progress Report 16 (1). 1960.

Ziller, W. G. *Caeoma faulliana*, synonym of the tree rust fungus *Melampsora albertensis*. Can. J. Bot. 38:869–871. 1960.

Work was continued on the "Forest Lepidoptera of Canada" series, and further volumes should appear in late 1961 or 1962. A comprehensive review of biological control attempts against forest insects in Canada has been completed and will be available for distribution late in 1961.

A number of changes have been made in the format of this report in recent years and the reactions and comments of readers are always appreciated.

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PROVINCE OF NEWFOUNDLAND

FOREST INSECT SURVEY

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Forest Biology Laboratory, Corner Brook, Newfoundland

INTRODUCTION

The summer of 1960 was unusually dry with relatively high temperatures from late May to early September. Increased numbers of several important forest insects were recorded. Branch counts of the balsam woolly aphid in the Humber Valley showed a significant increase over 1959, and new infested areas were discovered. Light to moderate black-headed budworm outbreaks occurred on the Avalon and Burin peninsulas and a small hemlock looper outbreak was recorded in western Newfoundland. Spruce budworm numbers increased in St. George's and St. Barbe districts. Larch sawfly outbreaks continued in central Newfoundland but insect numbers were greatly reduced in eastern and western regions. The yellow-headed spruce sawfly infestation subsided in the Terra Nova area but continued at approximately the same level as last year in the Upper Humber Valley. There was a slight increase in numbers of the balsam-fir sawfly over a small area near Gallants.

Special projects carried on by the Survey included a continuation of the study of the impact of the introduced shrew, *Sorex cinereus cinereus* Kerr., on the larch sawfly in St. George's District and an investigation of the life history and morphology of the balsam-fir sawfly. The 1,835 insect collections received at the Laboratory, represent an increase of 781 over 1959. The collections submitted by various co-operating agencies are gratefuly appreciated. The laboratory is also indebted to the Anglo-Newfoundland Development Company Limited and to Bowater's Pulp and Paper Mills Limited for providing aircraft for aerial surveys of otherwise inaccessible regions.

The distribution of collections by principal host trees was as follows:

Coniferous Trees	Collections	Broad-leaved Trees	Collections
Balsam fir	680	Birch	72
Spruce	534	Poplar	62
Tamarack	319	Others	168
	Grand Total	1,835	

IMPORTANT INSECTS

Balsam Woolly Aphid, *Adelges piceae* (Ratz.)—The balsam woolly aphid continued to be the most important forest insect problem in Newfoundland. Changes were recorded in the boundaries of all infested areas. In the west, the outbreak extended into the Grand Lake region (see accompanying map). Infested trees were located along the shores of the southern half of Grand Lake from Grand Pond Point to Northern Harbour, and also on Glover Island. In the Little Grand Lake area the outbreak extended from the mouth of Little Grand Lake Brook along the shores of the Lake and about two miles up Lewaseechjeech Brook. The infestation is generally light except for six spots of severe attack ranging in size from 2 to 10 acres, where all the trees are damaged and some have been killed. Along the shores of the lakes about 5 to 10 per cent of the trees are

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infested, but between the two lakes this figure drops to about 2 per cent. The infestation is not more than three to five years old; 'gout' is the predominant symptom of injury and 'stem attack' occurred only in the more heavily damaged spots. Aerial observations indicated small spot infestations on the height of land southeast of Little Grand Lake, and in a valley southeast of Corner Brook Lake. These observations were not confirmed by ground inspection. The infested area in western Newfoundland is now about 2,000 square miles.

In eastern Newfoundland balsam woolly aphid injury was recorded for the first time at Petty Harbour on the Avalon Peninsula and at Red Harbour on the Burin Peninsula.

No other extensions of aphid outbreak areas were recorded and in the older infestation south of Stephenville Crossing tallies indicated only slight changes in damage from 1959. In the more recent outbreaks in Humber District, there was a noticeable increase in injury in the form of curled tips of the current year's shoots. D. G. Bryant reported increases in the numbers of aphids from sample units from 'gouty' trees in Humber Valley from 3.7 and 3.6 in 1958 and 1959 to 17.3 in 1960. Important extensions of present boundaries and considerable damage to balsam fir can be expected during the next few years unless severe winter conditions reduce aphid numbers.

The biological control program was continued and 10 species of insect predators were released in 1960, bringing the total number of species released in Newfoundland to 14. Three species, *Neoleucopis obscura* Hal., *Laricobius erichsonii* Rosen., and *Pullus impexus* Muls., have become established. The last two species have been recovered only in small numbers near release sites, but *N. obscura* has dispersed more than 20 miles and is fairly numerous. D. G. Bryant also recorded 53 cecidomyiid larvae feeding on aphids in the branches one-half mile from a 1959 release site of *Aphidoletes thompsoni* Möhn. Identification has not been confirmed but, if these larvae are *A. thompsoni*, observations suggest that it may become a valuable predator.

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—Although budworm population levels remained low, there was a conspicuous increase in numbers collected in western Newfoundland. A total of 1,472 larvae was collected compared with 71 in 1959. The highest numbers were recorded in St. Barbe and St. George's districts but numbers per tree sample were still low, ranging from three to six larvae. About 700 larvae were reared; 95 per cent emerged as adults and no parasites were obtained. Data from egg mass sampling do not indicate any significant increases in 1961. The highest egg counts of one egg mass per 100 square feet of foliage were recorded in the Stephenville area.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1959
4	187	2.62	+1.9

Eastern Hemlock Looper, *Lambdina fiscellaria fiscellaria* (Gn.)—A light to moderate outbreak occurred between Journois Brook and Barry Brook about 10 miles south of St. George's. The infested area was about one-half square mile and current defoliation ranged from 10 to 20 per cent. Elsewhere larval numbers remained at approximately the same level as last year, with the highest number of 15 per tree sample being recorded at Burgoyne's Cove near Clarenville. The light outbreak that occurred in 1959 at Hunt's Cove, Gander Lake, has been terminated by cutting the stand. Samples from surrounding trees produced only small numbers of larvae, indicating that the threat of a severe outbreak has been temporarily removed.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1959
4	92	1.0	0

Black-headed Budworm, *Acleris variana* (Fern.)—A light to moderate black-headed budworm outbreak occurred on the Avalon and the Burin peninsulas. Defoliation of the current growth of balsam fir and white spruce trees near Topsail and Torbay was 70 and 20 per cent respectively over about 40 square miles. Near Fairhaven and Fortune a similar area was affected but loss of new foliage was less than 5 per cent. Elsewhere population levels were low.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1959
5	193	1.4	−0.3

Balsam-fir Sawfly, *Neodiprion abietis* (Harr.)—There was no major change in the status of this sawfly in 1960. Occasional colonies of larvae were again recorded near George's Lake, Gallants, and Grand Lake Road. At Awachenjeech Brook a light to moderate outbreak was restricted to a few acres. Infestation levels showed wide variation between trees and defoliation ranged from a trace to 50 per cent of the old foliage on immature balsam fir trees. In western Newfoundland, larval numbers averaged about 18 per tree sample and less than one in the eastern and central districts. Studies on this insect have shown fairly high levels of natural parasitism and disease for the past three years. Complete data for 1960 are unavailable, but, judging from the high adult emergence, natural control factors were at a relatively low level.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1959
1	230	14.2	+4.2

Spruce Budmoth, *Zeiraphera ratzeburgiana* Ratz.—Larvae were common again this year on white spruce in St. George's and Humber districts, and on the Avalon Peninsula. Foliage loss was generally less than 10 per cent. This species has been recorded for several years, causing defoliation ranging from a trace to 60 per cent of new growth. Larval numbers per tree sample were slightly lower in 1960 than in 1959.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1950
2	41	5.3	−0.2

European Spruce Sawfly, *Diprion hercyniae* (Htg.)—Population levels were about the same as in 1959. Larvae were common in spruce collections from all regions. Numbers of larvae per tree sample were 1.8, 3.7, and 4.0 in western, central and eastern Newfoundland respectively. Several collections contained dead larvae showing symptoms of a virus disease and rearing mortality from disease was also high. Evidently, the introduced virus is still a valuable control factor.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1959
2	244	3.1	+1.1

Yellow-headed Spruce Sawfly, *Pikonema alaskensis* (Roh.)—The decrease in larval numbers apparent in 1959 continued in 1960. The highest population levels were recorded on black spruce regeneration in the Upper Humber Valley. Loss of the current year's foliage generally ranged from 5 to 30 per cent although in a few cases it was as high as 90 per cent. The severe outbreak that persisted near Terra Nova for the past three years subsided and only a few larvae were collected. The collapse of the outbreak was attributed mainly to natural parasitism.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1959
3	81	2.70	−1.8

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European Pine Shoot Moth, *Rhyacionia buoliana* (Schiff.)—Collections of this insect from ornamental pines were received from eastern and western Newfoundland. Injury in the west was generally light while reports from the Avalon Peninsula indicate that damage was fairly severe.

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—The larch sawfly increased in abundance in central Newfoundland but in other regions there was a decrease (see accompanying map). Conditions varied considerably between stands and between trees in infested stands. In the west, defoliation generally ranged from 5 to 30 per cent but in a few cases it reached 70 per cent. In eastern and northern districts it did not exceed 20 per cent. In many stands in central Newfoundland defoliation was 90 per cent or higher although in other stands it was less than 20 per cent.

The value of the introduced shrew as a predator was assessed by planting cocoons throughout the release plot. Fifteen per cent of the cocoons were chewed by shrews and the larvae eaten, and an additional 19 per cent were missing and presumed to represent the combined work of mice and shrews. Other causes of cocoon mortality were as follows: Parasitism, 18 per cent; died from other causes, possibly disease, 7 per cent; chewed by mice, 7 per cent; chewed by insects, 3 per cent. These observations, combined with shrew establishment and dispersal data accumulated by Dr. C. F. MacLeod, indicate that the shrew has become established in western Newfoundland and that larch sawfly cocoons form an important part of its diet. Plans are now being made to introduce the shrew to central Newfoundland.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1959
8	141	26.9	+16.9

Satin Moth, *Stilpnotia salicis* (L.)—Larval collections were received from the Town of Deer Lake again this year and there were several reports of severe defoliation of ornamental poplars. No other collections were made in the Province.

		Larvae per tree sample
Reports	Collections	Av.
2	6	21.0

Birch Casebearer, *Coleophora fuscedinella* (Zell.)—High numbers of this casebearer were again recorded between Stephenville Crossing and White's Farm. Severe browning of foliage was confined chiefly to roadside white birch saplings.

		Larvae per tree sample
Reports	Collections	Av.
1	6	8.1

Poplar Leaf Roller, *Anacampsis innocuella* Zell.—The outbreak of this leaf roller on trembling aspen in central and eastern Newfoundland in 1957 and 1958 subsided in 1959. However, in 1960, numbers again increased and light to moderate defoliation occurred in the Glenwood and Bishop's Falls areas.

Reports	Collections
2	14

Birch Leaf-mining Sawfly, *Heterarthrus nemoratus* (Fall.) and Birch Leaf Miner, *Fenusa pusilla* (Lep.)—Browning of the foliage of young white birch trees occurred in central Newfoundland again this year. Injury was generally moderate and less noticeable than in 1959.

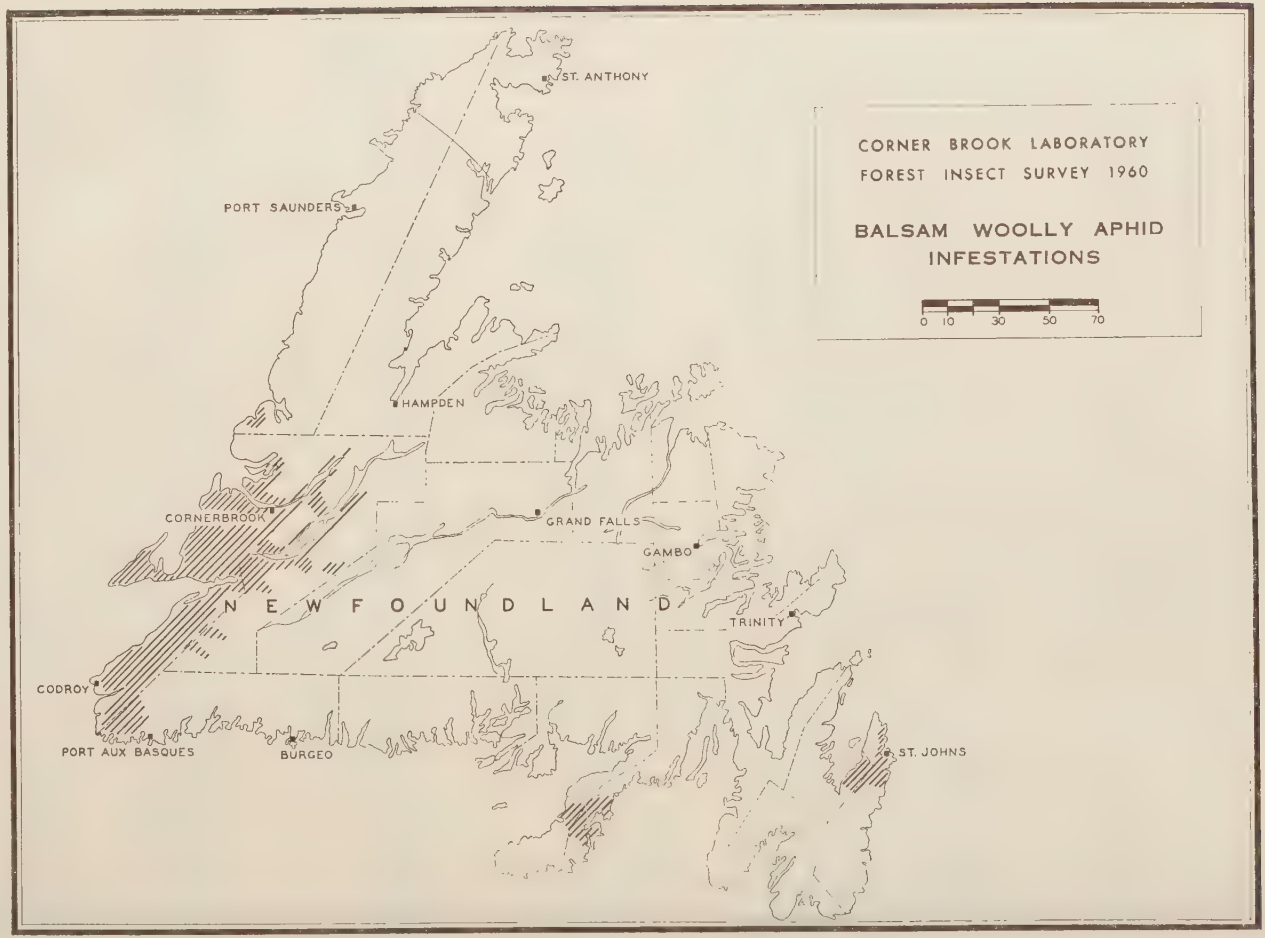
Reports	Collections
2	44

Mountain-ash Sawfly, *Pristiphora geniculata* (Htg.)—This sawfly was recorded in all parts of the Province except the Northern Peninsula. Complete defoliation of scattered trees was recorded.

		Larvae per tree sample
Reports	Collections	Av.
2	37	37.0

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Chrysomela falsa Brown	Aspen and Willow	Grands Fall District	Moderate to severe defoliation
Croesus latitarsus Nort.	Birch	Grand Falls District	Small pocket moderate defoliation
Coleophora laricella (Hbn.)	Tamarack	St. George's District	Only slight browning
Fenusa dohrnii (Tischb.)	Alder	Grand Falls	Moderate to severe browning
Pikonema dimmockii (Cress.)	Spruce	Most locations	Higher numbers than in 1959
Phenacaspis pinifoliae (Fitch)	Spruce	St. George's District	Severe over small area
Solenobia walshella (Clem.)	Fir and Spruce	Most locations	Increased numbers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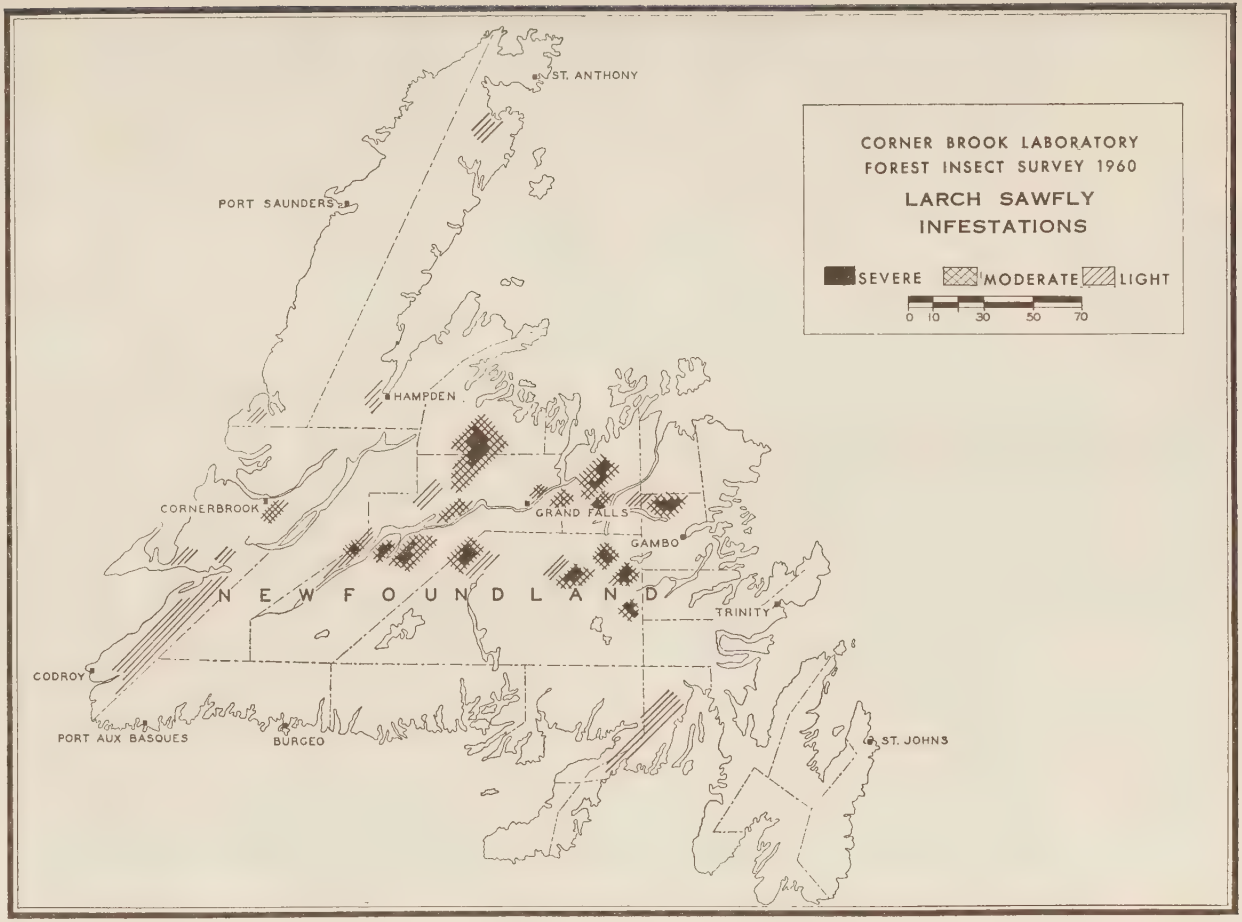
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PROVINCE OF NEWFOUNDLAND

FOREST DISEASE SURVEY

W. J. Carroll and A. G. Davidson[1]

Forest Biology Laboratory, Corner Brook, Newfoundland

The policy of collecting for identification forest tree diseases not readily diagnosed in the field and submitting reports of common diseases was continued in 1960. A total of 59 collections was submitted to the Forest Biology Laboratory at Fredericton and 124 reports were recorded at the Corner Brook Laboratory.

Weather conditions in 1960 were generally unfavourable for the development of tree diseases. There were no severe frosts and a fairly adequate snow cover prevailed throughout most of the winter. Late frosts were relatively rare and summer started about two weeks earlier than usual, and continued to be exceptionally warm and dry throughout. As a result of this favourable combination of weather conditions, such non-parasitic diseases as winter drying of conifers and late-frost injury were rare and there was a definite decline in the incidence of parasitic diseases. However, there was an increase in reports of premature drying of white birch foliage, and Armillaria root rot, although less evident than in 1959, was recorded again. Needle rusts and needle casts were less conspicuous than in 1959.

IMPORTANT DISEASES

Armillaria Root Rot—Killing of black spruce regeneration by *Armillaria mellea* (Vahl ex Fr.) Quél. occurred again this year in the Upper Humber. However, trees showing symptoms of recent attack were less evident than in 1959. On the basis of the counts made, less than 1 per cent of the trees showed symptoms of injury. In the 1951 burn at Hall's Bay Armillaria root rot is causing similar damage to spruce reproduction.

Drying of Birch Foliage—The premature drying and curling of white and yellow birch foliage was common throughout the Province. Leaf curling was most conspicuous on immature polesized trees although some reproduction was affected. The condition was reported in June this year before completion of leaf growth. This condition usually does not become apparent until mid-August. The cause of the disorder is unknown. Leaf scorch was also evident on roadside birch trees in a number of localities.

White-pine Blister Rust—This disease caused by *Cronartium ribicola* J. C. Fisch. ex Rabenh. was recorded wherever white pine occurs in Newfoundland.

Eastern Dwarf Mistletoe—Injury to black spruce by *Arceuthobium pusillum* Peck was recorded again in the Grand Lake and Badger areas as in 1959.

Needle Rusts and Needle Casts of Conifers—Needle rusts were generally inconspicuous this year and only a few light infections were observed. Needle cast was evident in only a few localities, chiefly on spruce.

Leaf and Twig Blight of Poplar—This disease on trembling aspen, caused by *Pollaccia radiosa* (Lib.) Bald. and Cif., was common on reproduction at localities in central and eastern Newfoundland. The disease on balsam poplar, caused by *Pollaccia elegans* Serv., was severe at Random Island.

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MARITIME PROVINCES

FOREST INSECT SURVEY

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INTRODUCTION

Insects of major concern in the Maritime Provinces in 1960 were the spruce budworm, balsam woolly aphid, winter moth, larch sawfly, eastern hemlock looper, and beech scale. Moderate to severe infestations of the spruce budworm continued in central New Brunswick. Slight increases in numbers occurred in coastal areas of Victoria County, Nova Scotia, and inland in this county spruce budworm–eastern hemlock looper infestations caused severe defoliation of the larger balsam fir trees over a sizeable area. Further decreases in budworm numbers occurred in Prince Edward Island and defoliation was negligible. No change was observed in the northern limits of the balsam woolly aphid in New Brunswick. In older areas of infestation 'stem attack' was scattered and mostly light but 'gout' was prevalent and continued to cause growth loss and kill trees. Moderate to severe infestations of winter moth were again common in red oak stands along the South Shore of Nova Scotia and in unsprayed apple orchards in Kings and Hants counties. Larch sawfly collections in New Brunswick increased about fivefold from 1959 and light defoliation was observed on a few trees at two locations. In Nova Scotia light infestations were more extensive than in 1959 but moderate and severe attacks occurred only in a few scattered locations. High population levels of the eastern hemlock looper were found for the first time since 1930. Plot records of beech scale indicate that the proportion of infested trees has increased from earlier years, but recent attacks were generally light.

New records of distribution were obtained for the beech scale, winter moth, and *Xylococculus* sp. Parasite records new to the Survey in the Maritimes were obtained for the winter moth and the ugly-nest caterpillar.

Thanks are extended to the Crown agencies and pulp and paper companies who cooperated with the Survey in taking collections and who provided services and facilities.

Insect collections totalled 3,597: New Brunswick, 1,682; Nova Scotia, 1,869; Prince Edward Island, 46. Special reports on insect conditions totalled 365. The numbers of collections by major tree species were as follows:

Coniferous Trees	Collections		Broad-leaved Trees	Collections	
Balsam fir		716	Birch		
Spruce			White birch	150	
White spruce	580		Wire birch	56	
Red spruce	167		Yellow birch	40	
Black spruce	15		Miscellaneous birches	7	
Miscellaneous spruces	25				253
		787	Poplar		
Tamarack		392	Trembling aspen	91	
Pine			Silver poplar	29	
Eastern white pine	117		Largetooth aspen	7	
Red pine	46		Balsam poplar	7	
Jack pine	23		Carolina poplar	6	
Scots pine	13		Lombardy poplar	3	
Miscellaneous pines	3		Miscellaneous poplars	20	
		202			163

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Coniferous Trees	Collections	Broad-leaved Trees	Collections	
Eastern white cedar	25	Oak		
Eastern hemlock	9	Red oak	121	
		White oak	1	
				122
Total	2,131	Maple		
		Red maple	54	
Miscellaneous hosts or host unspecified	311	Sugar maple	16	
		Silver maple	6	
		Miscellaneous maples	27	
				103
		Cherry	102	
		Alder	97	
		Apple	93	
		White elm	73	
		Beech	54	
		Willow	53	
		Mountain ash	42	
				514
		Total		1,155
		Grand Total	3,597	

IMPORTANT INSECTS

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—The budworm situation in 1960 was characterized by a continuation of moderate to severe infestations across the central part of New Brunswick, some resurgence of outbreak on balsam fir and white spruce in Victoria County, Nova Scotia, and a further decrease in intensity of attack in Prince Edward Island. The accompanying map shows the nature and extent of infestations based on aerial and ground surveys. The infestation classes used in the past are continued, and the interpretation of light infestations given in the 1959 Report is followed.

In New Brunswick most areas of moderate and high population levels north and west of Brockway, Fredericton, Chipman, Harcourt, and Newcastle were sprayed. Aerial surveys conducted by Forest Protection Ltd. and ground observations showed that extensive areas of moderate and severe defoliation occurred within the sprayed area, particularly in the Cains and Salmon River areas, the upper valley of the Southwest Miramichi, and in some areas drained by the Upper Nashwaak, Keswick, and Becaguimec rivers. This loss of foliage resulted from purposely late applications of spray designed to obtain high insect kill and minimize the probability of spread to northern areas. Large areas of moderate and severe defoliation also occurred outside the sprayed areas, particularly in northern York, Kent, Northumberland, and Gloucester counties. As in 1959, attacks within the infested area were extremely diversified and patchy. Except for small areas of light infestation in scattered locations, budworm population levels in northern and southern New Brunswick were low. Balsam fir was the principal host but red spruce trees were often attacked and a few have died from repeated defoliation, particularly those growing in and near stands containing a high proportion of fir. Occasional attacks were observed on white spruce.

No reports were received of mass migrations of moths.

Egg surveys indicated that moderate to severe infestations will continue throughout much of central New Brunswick in 1961, and in sizeable areas in Kent County, southeastern Northumberland County, and in the Tabusintac River area.

In Nova Scotia the spruce budworm, in association with the eastern hemlock looper, caused severe loss of old and new foliage of dominant and co-dominant balsam fir trees in central Victoria County (boundaries described under "eastern hemlock looper"). The infestation covered an area of about 90 square miles in stands consisting largely of 60-year-old balsam fir with some red spruce and yellow

birch. Little defoliation was observed on red spruce. Many of the stands were attacked by the spruce budworm in the 1950's and severe 'gout', caused by the balsam woolly aphid, is common in much of the area. These attacks have caused general deterioration of many trees and some mortality. The proportions of the budworm and the looper were not determined because the damage was not discovered until late in the season. Budworm egg sampling within the infested area was conducted only at French Lake where numbers were low to moderate. It is not possible to predict the status of either insect for 1961.

Other areas in Victoria County where defoliation was observed were at Ingonish where about 10 per cent of the new foliage on dominant white spruce was destroyed, and along the coast near Wreck Cove where white spruce trees were similarly attacked and a few balsam fir trees had lost about 20 per cent of their new needles. Elsewhere, numbers of the budworm were low. Egg masses were found at 15 of 64 locations sampled: 11 in eastern Nova Scotia, and 4 in western Nova Scotia. On the basis of these counts population levels are expected to be high in 1961 only in northeast Victoria County along the coast between Warren Brook and Wreck Cove.

In Prince Edward Island the loss of new foliage of balsam fir was negligible. Small numbers of eggs were found at 6 of 34 locations sampled, indicating that budworm numbers will again be low in 1961.

			Larvae per tree sample	
	Reports	Collections	Av.	Dev. from 1959
New Brunswick	14	156	7.2	+2.3
Nova Scotia	12	48	1.8	+0.3
Prince Edward Island	2	6	—	—

Balsam Woolly Aphid, *Adelges piceae* (Ratz.)—The known northern limits of this insect in New Brunswick have not changed. 'Stem attacks' were usually light. Although 'gout' continued to cause deterioration and mortality, the rate of spread and damage has decreased in recent years.

In co-operation with D. O. Greenbank, 100 bark samples were collected at 55 localities to collect data on 'stem attack' and phenology. These showed moderate and severe stem infestations in the following areas:

New Brunswick—Bantalor Road, Debec, Grand Anse, Covedell, Six Roads, and Tracadie.
Nova Scotia—Kemptown, Tatamagouche.

Examination of tallies on 17 plots showed that some trees changed between 1956 and 1960 from an uninfested condition to one of severe 'gout' and some had died. All the trees over 4 inches D.B.H. on a plot at Grand Anse, Gloucester County, New Brunswick, were dead. Seventy per cent of the trees on a plot established at Springfield, Kings County, New Brunswick, were dead or windthrown when the plot was cut in 1957 and all the cut trees had 'gout' damage. A plot at Lakeview, Albert County, New Brunswick, with no trace of the insect in 1956, had 8 per cent of the trees with light to moderate 'gout' in 1960. On 10 plots in Nova Scotia from 65 to 90 per cent of the trees had 'gout' damage and from 2 to 40 per cent of the trees were dead.

Observations made at 16 localities in Prince Edward Island showed that 'gout' was moderate to severe at eight and light in the remaining areas. Numerous dead trees were noted at Milton.

R. C. Clark reported that the introduced predator, *Laricobius erichsonii* (Rosen.), was the dominant species in the complex of predators in the Fredericton district and was primarily responsible for reducing 'stem attacks' to low levels.

	Reports	Collections
New Brunswick	2	29
Nova Scotia	8	48
Prince Edward Island	1	—

Gall Midges on Balsam Fir Needles, *Dasyneura* sp. prob. *balsamicola* (Lint.), and a species near *Cecidomyia*—Midge numbers continued to decrease and for the first time since 1955 severe infestations were not observed.

In New Brunswick moderate attacks occurred at Canterbury and West Waterville, York County, and light infestations were reported at a number of locations in York, Carleton, Restigouche, and Northumberland counties. In Nova Scotia only a few infested needles were found in areas where attacks were previously severe. A few scattered infestations of light intensity were located in Halifax and Hants counties. Galled needles were not found in Prince Edward Island.

	Reports	Collections
New Brunswick	3	7
Nova Scotia	2	10

Eastern Hemlock Looper, *Lambdina fiscellaria fiscellaria* (Guen.)—Severe insect damage to balsam fir in central Victoria County, Nova Scotia, was attributed in part to the eastern hemlock looper. This infestation covers an area of about 90 square miles west and south of Wreck Cove and Gisborne Lakes to slightly beyond the Inverness–Victoria County line and to the headwaters of Barachois River. The nature of infestations is discussed under "spruce budworm" in more detail. The extent to which the eastern hemlock looper was responsible is uncertain, but it constituted a high proportion of the population near French Lake and in the Barachois River area. Old pupal cases indicated that the species was present in numbers prior to 1960. Discoloration of foliage as observed from the air was later than expected if attributable to the spruce budworm, and it was concluded that the eastern hemlock looper was responsible for a large part of the damage in the whole area.

This is the first report since 1930 of high hemlock looper numbers in the Maritime Provinces. Elsewhere in these provinces, population levels were low.

			Larvae per tree sample	
	Reports	Collections	Av.	Dev. from 1959
New Brunswick	3	29	0.6	0.0
Nova Scotia	7	111	0.9	+0.1

Balsam-fir Sawfly, *Neodiprion abietis* complex—The localized infestation reported in 1959 between Glenholme, Colchester County, and Westchester Station, Cumberland County, persisted, with an easterly extension to East Mines. Only light defoliation of the old needles of balsam fir was observed between Londonderry Mines and Sutherland Lake, the area of more severe defoliation in 1959. This reduction was attributed to a virus disease. The most noticeable defoliation was approximately five miles to the south, near Londonderry Station, where damage to old foliage of balsam fir was light to moderate.

The localized outbreak was markedly reduced at East New Annan, Colchester County, where the incidence of the virus disease was high.

Light loss of old foliage of red spruce and black spruce trees was observed along the east coast, between Musquodoboit Harbour, Halifax County, and Canso, Guysborough County. Near Blue Mills, Inverness County, balsam fir was attacked to a similar degree.

Some parasites reared from cocoons were *Tritneptis* sp. poss. *diprionis* Gahan, *Delomerista diprionis* Cush., *Agrothereutes* sp., and *Gelis tenellus* (Say).

	Reports	Collections
New Brunswick	2	37
Nova Scotia	13	66

Balsam Shoot-boring Sawfly, *Pleroneura borealis* Felt—Numbers of this insect, which kills shoots it attacks, were slightly higher than in 1959, but damage was light. Low population levels were recorded at many localities throughout New Brunswick and in Inverness, Colchester, and Cumberland counties, Nova Scotia.

	Reports	Collections
New Brunswick	8	25
Nova Scotia	2	3

European Spruce Sawfly, *Diprion hercyniae* (Htg.)—For many years numbers of European spruce sawfly larvae have been presented in this Report as averages per tree sample for each of the Maritime Provinces. This index was based on total numbers of larvae collected throughout the season. However, separate treatment of data for each generation, and special attention given to the handling and rearing of larvae in instars 4, 5, and 6 have led to more accurate results.

The numbers of larvae collected in instars 4, 5, and 6 and the incidence of disease and parasitism in each generation in New Brunswick and in Nova Scotia in 1959 and 1960 are summarized below:

Province	Generation	No. larvae collected (instars 4, 5, 6)		Av. no. larvae per tree sample		Per cent diseased		Per cent parasitized	
		1959	1960	1959	1960	1959	1960	1959	1960
New Brunswick	1	158	233	1.0	1.1	5.9	0.4	0.7	4.2
	2	295	672	1.9	3.2	8.1	6.9	2.5	5.5
Nova Scotia	1	213	508	1.3	1.9	0	6.6	3.7	7.9
	2	375	544	2.3	2.7	9.3	13.4	6.4	15.4

Numbers of larvae increased considerably at some sampling stations from 1959, but no defoliation was observed. The locations where the highest numbers of second generation larvae were found, with averages per tree sample, follow:

New Brunswick—Campbellton, 14.3; Waweig, 11.3.

Nova Scotia—Truemanville, 24.3; Harrison Settlement, 13.0; Allen Hill Road, 18.0; Trafalgar, 13.3; Squirreltown, 11.3; West Inglisville, 14.3.

	Reports	Collections
New Brunswick	13	122
Nova Scotia	12	244

Yellow-headed Spruce Sawfly, *Pikonema alaskensis* (Roh.)—Localized but severe infestations on red spruce trees were reported in Nova Scotia near Aspen and at Melrose, Guysborough County, and at Shortt's Lake, Colchester County. Loss of new foliage was light on occasional red spruce trees in Colchester, Cumberland, Hants, and Inverness counties. Defoliation was light on small white spruce trees at Connors, Madawaska County, N.B., where damage was moderate to severe in 1959.

	Reports	Collections
New Brunswick	2	28
Nova Scotia	9	87

Spruce Bud Midge, *Rhabdophaga swainei* Felt—Dead red spruce and white spruce buds, resulting from attacks of this midge in 1959, were observed at many places in central and northern New Brunswick. They were common on red spruce at Tracadie and, as in 1959, on white spruce at Belledune, Gloucester County.

Over half the successful rearings produced parasites, including the chalcidoids *Amblymerus* sp. and *Torymus* sp. The insect was not reported from Nova Scotia or Prince Edward Island.

	Reports	Collections
New Brunswick	10	20

Yellow Spruce Budworm, *Zeiraphera fortunana* Kft., and ***Spruce Bud Moth,*** *Zeiraphera ratzeburgiana* Ratz.—Collections at permanent sampling stations and general observations showed that larvae of both species were common on young white spruce trees in all districts except western Nova Scotia, where only one collection of *Z. fortunana* and three of *Z. ratzeburgiana* were taken. Numbers of both species increased slightly in northwestern New Brunswick but decreased in the remaining districts. The largest decrease occurred in northeastern New Brunswick where the average number of *Z. ratzeburgiana* beaten per tree sample dropped from 12 in 1959 to 2 in 1960; corresponding averages for *Z. fortunana* decreased from 4 to 1. Traces of defoliation were recorded only in New Brunswick.

	Reports	Collections
New Brunswick	3	47
Nova Scotia	4	29

Larch Casebearer, *Coleophora laricella* (Hbn.)—Except for a trace of defoliation on a few tamarack trees near North East Margaree, Inverness County, N.S., infestations of the casebearer have subsided throughout the Maritimes. This represents a striking decrease in numbers in Nova Scotia from 1959 when moderate to severe infestations were widespread.

Sequential sampling of overwintering larvae at 80 permanent sampling stations indicated the following population levels and infestation classes by districts:

District	No. sampling stations	Av. no. cases per sample	Deviation from 1959	Infestation class
Southern New Brunswick	18	0.5	−0.7	Light
Northeastern New Brunswick	13	0.8	+0.6	Light
Northwestern New Brunswick	14	1.0	−0.4	Light
Eastern Nova Scotia	16	3.8	−26.3	Light
Western Nova Scotia	16	4.1	−26.0	Light
Prince Edward Island	3	2.1	−0.7	Light

The introduced parasites, *Epilampsis laricinellae* (Ratz.) and *Agathis pumila* (Ratz.), were common in collections from widely separated areas, and *A. pumila* was recovered in Carleton County, N.B. and in Kings and Queens counties, Prince Edward Island, for the first time.

	Reports	Collections
New Brunswick	3	43
Nova Scotia	5	30
Prince Edward Island	1	3

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—The last outbreak of the larch sawfly in the Maritime Provinces ended in 1942, and from 1943 to 1953 only six collections were taken in the Region (Reeks, W. A., Can. Ent. 86: 471-480. 1954). Since 1953 the following numbers of collections of the insect were taken in New Brunswick and in Nova Scotia:

	1954	1955	1956	1957	1958	1959	1960
New Brunswick	1	4	0	1	2	13	75
Nova Scotia	1	4	46	232	101	122	100

There is no doubt that the insect has become more common in New Brunswick, and in Nova Scotia where it has been found over wide areas. No collections were taken during this period in Prince Edward Island.

The accompanying map shows the nature and extent of infestations in the Maritimes. Except for light loss of foliage on a few small tamarack trees at Wagansis Brook, Madawaska County, and in the woodlot of the University of New Brunswick, defoliation was negligible in New Brunswick. In Nova Scotia, where varying degrees of defoliation have occurred for several years, tamarack stands with defoliation ranging from trace to light were found over wider areas than in 1959. Defoliation was moderate to severe near Hassett, Digby County, and severe localized infestations occurred at Goff's Corner, Halifax County and Sydney Mines, Cape Breton County. Moderate defoliation (30 to 60 per cent) was observed at Economy, Colchester County, from Salmon River Bridge to 3 miles southwest of Ship Harbour, and near Pope's Harbour, Halifax County.

	Reports	Collections
New Brunswick	11	75
Nova Scotia	10	100

Pine Leaf Chermes, *Pineus pinifoliae* (Fitch)—White pine trees lost over 50 per cent of their 1959 shoots along the Southwest Miramichi River between Boiestown and Renous and in the southern parts of York and Sunbury counties in New Brunswick, and at New France, Digby County in Nova Scotia. These conditions resulted from a moderate infestation in 1959, the full effect of which was not evident until the spring of 1960.

For the first time since 1940 galls were collected from red spruce trees in an even-numbered year. Small numbers were found at 11 localities in Nova Scotia and two in New Brunswick.

	Reports	Collections
New Brunswick	10	10
Nova Scotia	4	12

Red-pine Sawfly, *Neodiprion nanulus nanulus* Schedl—Only a few colonies were collected in New Brunswick but traces of defoliation on red pine trees were observed at several localities. An infestation in a red pine plantation at Acadia Forest Experiment Station, that has persisted for many years, was sprayed with DDT. No surviving larvae were found.

A light infestation occurred on red pines in a one-acre mixed stand at Haliburton, Pictou County, Nova Scotia.

	Reports	Collections
New Brunswick	3	10
Nova Scotia	2	1

White-pine Weevil, *Pissodes strobi* (Peck)—This insect attacks the leaders of white pine and other pines, and several species of spruce. It has been a serious deterrent to the production of merchantable white pine timber in the Maritime Provinces. The results of attack in past years can be seen in crooked, knotty, and forked stems. Parasites reared by the Survey from the white pine weevil in the Maritimes are: the braconids, *Bracon pini* (Mues.) and *Coeloides pissodis* (Ashm.), the ichneumonid, *Exeristes nubilipennis* (Vier.), and the chalcidoids, *Rhopalicus pulchripennis* Cwfd. and *Eurytoma pissodis* Gir.

	Reports	Collections
New Brunswick	1	12
Prince Edward Island	1	—

European Pine Shoot Moth, *Rhyacionia buoliana* (Schiff.)—Light to moderate attacks were reported on red pine, Scots pine, and lodgepole pine in a nursery at Charlottetown, Prince Edward Island. Light attacks occurred on red pine and jack pine in a nursery at Lawrencetown, on ornamental Scots pine at

Middleton, and on mugho pine at Truro, Nova Scotia. Elsewhere in the Maritimes the insect was collected only in small numbers and only minor damage was reported.

	Reports	Collections
New Brunswick	1	1
Nova Scotia	4	2
Prince Edward Island	1	1

Birch Casebearer, *Coleophora fuscedinella* (Zell.)—The browning of white birch foliage was considerably reduced from 1959, particularly in central New Brunswick and on Cape Breton Island. Moderate browning was observed in New Brunswick along the Bantalor Road and from Boiestown to Upper Blackville. Light to moderate damage occurred from Blackville northeast to Barryville, and at Wine River on Route 37. Elsewhere in the Maritimes white birch trees were only lightly attacked. In Nova Scotia the insect was also common on alder and wire birch foliage.

	Reports	Collections
New Brunswick	7	38
Nova Scotia	3	24

Birch Leaf Miner, *Fenusa pusilla* (Lep.) and ***Birch Leaf-mining Sawfly,*** *Heterarthrus nemoratus* (Fall.)—The birch leaf miner, an introduced insect from Europe, and one which is widespread and often abundant in the Maritimes, continued to cause varying degrees of foliage browning on wire birch and to a lesser extent white birch trees. In general, small trees and reproduction were more severely attacked than larger trees. The insect causes an unsightly appearance but no killing of trees has been observed. Severe browning was observed as follows:

New Brunswick—near Chipman, Fredericton to Tracy, Upper Gagetown, Geary, Sussex Corner to Waterford, several locations along the Canaan Road, Havelock to Petitcodiac, Salisbury, Moncton to Hillsborough, Rosevale, and Hebert.

Nova Scotia—Annapolis Valley from Kentville to Annapolis Royal.

No collections of the birch leaf-mining sawfly were taken, whereas in former years this species was often associated with the birch leaf miner over wide areas of Nova Scotia.

	Reports	Collections
New Brunswick	9	11
Nova Scotia	7	55

Birch Skeletonizer, *Bucculatrix canadensisella* Cham.—Light skeletonizing of white birch leaves was reported at a few localities in Victoria and Carleton counties, New Brunswick. Light to moderate attacks occurred on white birch and light attacks on yellow birch in the Grand Anse Valley, Inverness County, Nova Scotia.

	Reports	Collections
New Brunswick	2	2
Nova Scotia	2	3

Satin Moth, *Stilpnotia salicis* (L.)—Some defoliation of silver, Carolina, Lombardy, and balsam poplars, and trembling aspen, was reported at many widely separated localities. It was severe on some ornamental poplar trees in many communities:

New Brunswick—Bristol, Riviere des Caches, Rogersville, Petit Rocher, Nigadoo, Jacquet River, and Moncton.

Nova Scotia—Hume Rear, Springhill, Southwest Margaree, Northeast Margaree, and Inverness.

Elsewhere in New Brunswick and in Nova Scotia defoliation was less severe.

	Reports	Collections
New Brunswick	11	14
Nova Scotia	8	23

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—The last severe outbreak in New Brunswick terminated in 1953 and since that time very few larvae have been collected. Seventeen moths were caught at a light trap operated at Fredericton and a like number at Nashwaaksis, compared with only three or four taken each year for the past few years. This suggests that numbers are increasing and larvae may be easier to find in 1961.

	Reports	Collections
New Brunswick	1	2

Beech Scale, *Cryptococcus fagi* (Baer.)—This insect was collected for the first time in Madawaska County, New Brunswick. It is now known to occur in all counties of the Maritime Provinces. Recent attacks were generally light. Moderate to severe infestations were noted in New Brunswick at Blissfield, Ludlow, and Monaghan Brook, Northumberland County; at Pacquetville, Boishebert, and Black Rock, Gloucester County; at Fredericton, on the Salmon River road, Kent County; and at Dorchester Westmorland County. In Nova Scotia similar conditions prevailed at Annis Lake, Queens County, and at East Folly Mountain, Colchester County.

The table shows the diminishing proportions of uninfested mature trees left on some of the beech plots maintained by the Survey; the trend is the same on all plots.

Location of plot	Uninfested trees (per cent)	
	1960	Previously (with year)
Indian Garden Road, Queens Co., N.S.	41	45 (1954)
Bayview, Digby Co., N.S.	14	61 (1957)
Glenwood, Restigouche Co., N.B.	33	61 (1955)
South Tilley, Victoria Co., N.B.	8	61 (1955)

	Reports	Collections
New Brunswick	2	28
Nova Scotia	5	2
Prince Edward Island	2	—

A Leaf Roller, prob. *Pseudexentera* sp.—This species caused considerable leaf rolling and defoliation on red oak trees in much of Lunenburg and Queens counties, Nova Scotia. As mentioned in the winter moth section below, the extent of the damage was often difficult to determine as most of the stands were also infested with the winter moth and the fall cankerworm. However, near Cherryfield and west of Forties Settlement, Lunenburg County, numbers of the winter moth and fall cankerworm were very low, and defoliation, attributed to the leaf roller, amounted to about 70 per cent.

	Reports	Collections
Nova Scotia	2	9

Winter Moth, *Operophtera brumata* (L.)—The known range of the winter moth in Nova Scotia was increased slightly by the collection of larvae in Pictou, at Afton, Antigonish County, at Cherryfield, Lunenburg County, and at Springfield, Annapolis County.

The most severe defoliation occurred in unsprayed apple orchards from Greenwich, Kings County to St. Croix, Hants County, and on red oak and apple trees in areas of older infestation: between Waverley and Halifax and along the coast to Head of St. Margaret's Bay; between Hubbards and Bridgewater and inland to Wentzell's Lake; between Mill Village and Liverpool along the

coast and north to include Middlefield and Greenfield; and between Port Joli Hills and Port Mouton. Moderate defoliation was observed throughout much of the remainder of western Halifax County, southern half of Lunenburg County, and eastern Queens County beyond Greenfield to Caledonia and Pleasant River. Also, about 60 per cent of the foliage on a few apple trees was destroyed at Lower Economy, Colchester County. Elsewhere defoliation was light.

In addition to the winter moth, the fall cankerworm and an undetermined leaf roller were often present on red oak trees in parts of Queens and Lunenburg counties. The proportions of the damage caused by these species were often difficult to determine but winter moth larvae usually predominated.

Counts of fall cankerworm and winter moth at several locations since 1956 suggest that winter moth numbers are increasing in proportion to those of the fall cankerworm. In some areas only the winter moth was found where formerly both species were present.

The native parasite, *Phobocampe clisiocampe* (Weed), was reared from winter moth for the first time.

	Reports	Collections
Nova Scotia	16	187

Fall Cankerworm, *Alsophila pometaria* (Harr.)—Noticeable defoliation of white elm trees in New Brunswick was observed from Sheffield to Jemseg. Here damage was mostly light to moderate but a few trees were almost completely defoliated between McGowan's Corner and Lakeville Corner. The insect was collected from elms at a number of locations in the Upper St. John River Valley and in the North Shore area but defoliation was negligible.

The insect was present in large numbers between Colpton and Nineveh, Lunenburg County, Nova Scotia, where red oaks were almost stripped of foliage. Light defoliation of this host occurred near Middledale, Queens County. The fall cankerworm and winter moth caused light defoliation of a few small white elms at Antigonish.

The fall cankerworm and winter moth were found together at a number of locations in the following proportions: Shelburne, 1:3; New Minas, Kings County, 1:7; Pleasant River, Queens County, 1:13; Waverley, 1:13; near Port Mouton, 1:24; Mahone Bay, 1:49; and Head of St. Margaret's Bay, 1:99.

A chalcidoid parasite, as yet undetermined, was reared in large numbers from fall cankerworm eggs taken at McGowan's Corner.

	Reports	Collections
New Brunswick	4	15
Nova Scotia	6	65

Spring Cankerworm, *Paleacrita vernata* (Peck)—This insect, in association with the winter moth, caused complete defoliation of a few 70-foot white elm trees and partial defoliation of others at Brooklyn, Hants County, Nova Scotia. Pupal sampling indicated that the spring cankerworm outnumbered the winter moth by 4 to 1. Confirmation of identification from adults has not been obtained.

	Reports	Collections
Nova Scotia	4	4

Spiny Elm Caterpillar, *Nymphalis antiopa* L.—This insect was more common than in recent years, and caused defoliation ranging from a trace to light on white elm, willow, trembling aspen, and Chinese elm trees at scattered locations in New Brunswick and in Nova Scotia.

The tachinid parasite, *Compsilura concinnata* Mg., killed about 40 per cent of the large number of larvae reared.

	Reports	Collections
New Brunswick	1	5
Nova Scotia	3	18

Ugly-nest Caterpillar, *Archips cerasivoranus* (Fitch)—Nests of this insect were common on roadside cherry bushes in many parts of the Maritimes. Nest counts from several areas 1000 feet square varied from nil to more than it was feasible to count.

No nests were found on plots at Greenfield, Havre Boucher, and Creignish where counts have been made since 1958.

A number of egg masses collected at Doaktown were heavily parasitized by *Trichogramma minutum* Riley. A parasite, *Exochus albifrons* (Cress.), first reared from this host in 1959, was found again in Nova Scotia in 1960.

	Reports	Collections
New Brunswick	10	19
Nova Scotia	8	40

Fall Webworm, *Hyphantria cunea* (Drury)—In New Brunswick population levels on roadside deciduous trees and shrubs remained about the same as in 1959. The highest number of nests was noted between Aulac and Cape Tormentine, Westmorland County, particularly in the Port Elgin area. Roadside counts of nests, where made, were generally less than one per mile.

Nests were common in the eastern half of Queens County, Prince Edward Island. Nests averaged 11 per mile near Glenfinnan and were too numerous to count near Scotchfort.

Population levels in Nova Scotia were generally lower than in 1959 but higher than those in New Brunswick. Less than 20 nests per mile were recorded in most areas where counts were made. Higher numbers were found in Colchester, Pictou, and Antigonish counties where counts increased from about 41 in 1959 to about 60 between Brule and River John and from 22 to 38 between Afton and Monastery.

Parasitism was high in all rearings with the larval parasite, *Apanteles hyphantriae* Riley, chiefly responsible.

	Reports	Collections
New Brunswick	6	21
Nova Scotia	4	84
Prince Edward Island	1	—

A Leaf Roller on Maple, *Sparganothis pettitana* (Rob.)—Red maple was severely defoliated in the Boiestown area of New Brunswick, particularly on the Boiestown–Bantalor road and at Astle. Less severe but conspicuous damage occurred near Little River and Minto, Sunbury County; Chipman, Queens County; and near Mt. Hope Tower, York County. Smaller numbers were collected at several localities in York and Northumberland counties, mostly along Route 8.

Larval parasitism was about 30 per cent, attributable mainly to a species of *Apanteles.*

	Reports	Collections
New Brunswick	13	21

Striped Alder Sawfly, *Hemichroa crocea* (Fourc.)—The infestation reported in 1959 on alders in Pictou County, Nova Scotia, has enlarged and now extends from Lower Mount Thom to French River. Small areas of attack were also reported near Moose River and at Blue Mountain, Pictou County. In all three areas defoliation was spotty and light, but up to 90 per cent of the leaves were destroyed on a few clumps of alder.

	Reports	Collections
Nova Scotia	2	5

Alder Flea Beetle, *Altica ambiens alni* (Harris)—Moderate defoliation of alders was observed in the Hibernia district of Camp Gagetown, New Brunswick. The beetle was more abundant in Nova Scotia where scattered but severe attacks were observed at the following locations: New Annan and Tatamagouche Mountain, Colchester County; from River John to Caribou River, Pictou County; Linwood, Antigonish County; Rawdon Gold Mines, Brooklyn, Avonport, and South Maitland, Hants County; and near Middledale, Queens County. Light to moderate defoliation was reported near Kemptown, Colchester County, and near Big Pond, Cape Breton County.

	Reports	Collections
New Brunswick	3	—
Nova Scotia	3	12

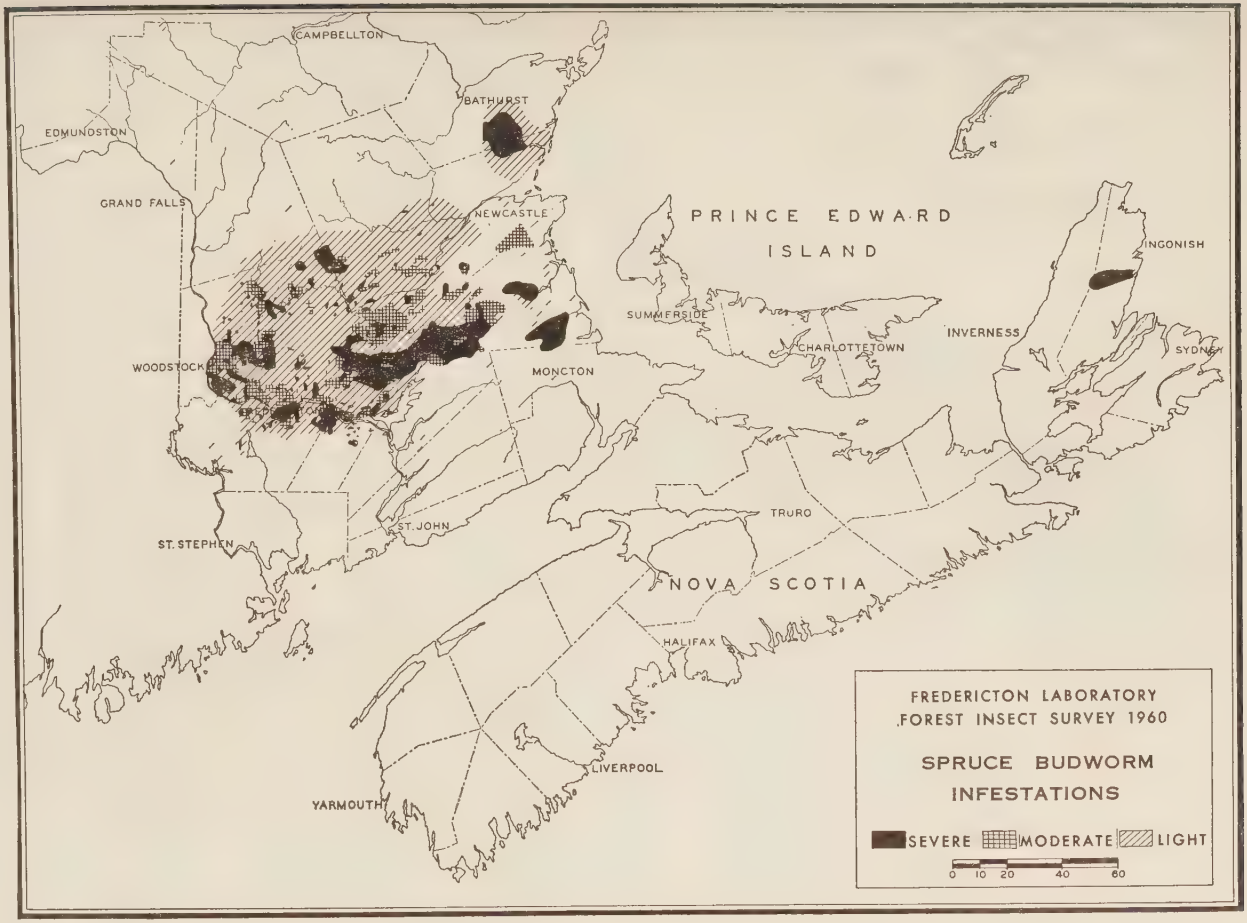
Lilac Leaf Miner, *Gracillaria syringella* (F.)—Variable amounts of browning of lilac leaves in hedges and shrubs were reported at Fredericton, Ludlow, Doaktown, Millerton, Blackville, Newcastle, Loggieville, Tabusintac, Caraquet, Tracadie, and Campbellton in New Brunswick, and from a number of scattered locations in Nova Scotia. Combined with a heavy incidence of mildew it made many hedges and shrubs rather unsightly.

A chalcidoid parasite, *Sympiesis* sp., was recorded.

	Reports	Collections
New Brunswick	6	3
Nova Scotia	1	2

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Acleris variana (Fern.) (Black-headed budworm)	Balsam fir (foliage)	Maritime Provinces	Population levels extremely low.
Argyresthia laricella Kft. (Larch shoot moth)	Tamarack (shoots)	12 scattered localities in N.B.	Population level 2 larvae/1000 shoots based on 27,696 shoots.
Cephalcia fascipennis (Cress.) (Blue spruce sawfly)	White spruce (old foliage)	Marysville and Upper Gagetown, N.B.	A hedge and one ornamental tree severely damaged in late 1959.
Hemerocampa leucostigma (J. E. Smith) (White-marked tussock moth)	General (foliage)	Maritime Provinces	Population levels extremely low.
Hylurgopinus rufipes (Eichh.) (Native elm bark beetle)	White elm (bark)	Near Woodstock, N.B.	Trees killed by Dutch elm disease in 1959 heavily infested.
Mindarus abietinus (Koch) (Balsam twig aphid)	Balsam fir (new needles)	Southern N.B.	More common than usual.
Pikonema dimmockii (Cress.) (Green-headed spruce sawfly)	White spruce (foliage)	New Brunswick, particularly the northeast.	Numerous in some samples but no defoliation observed.
Pristiphora geniculata (Htg.) (Mountain-ash sawfly)	Mountain ash (foliage)	N.B., N.S.	Occasional trees defoliated to varying degrees.
Xylococculus sp.	Beech (bark)	Colchester, Pictou, and Queens counties, N.S.	First record in Nova Scotia.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ST. STEPHEN
NOVA SCOTIA
HALIFAX
LIVERPOOL
YARMOUTH
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FOREST INSECT SURVEY 1960
SPRUCE BUDWORM
INFESTATIONS
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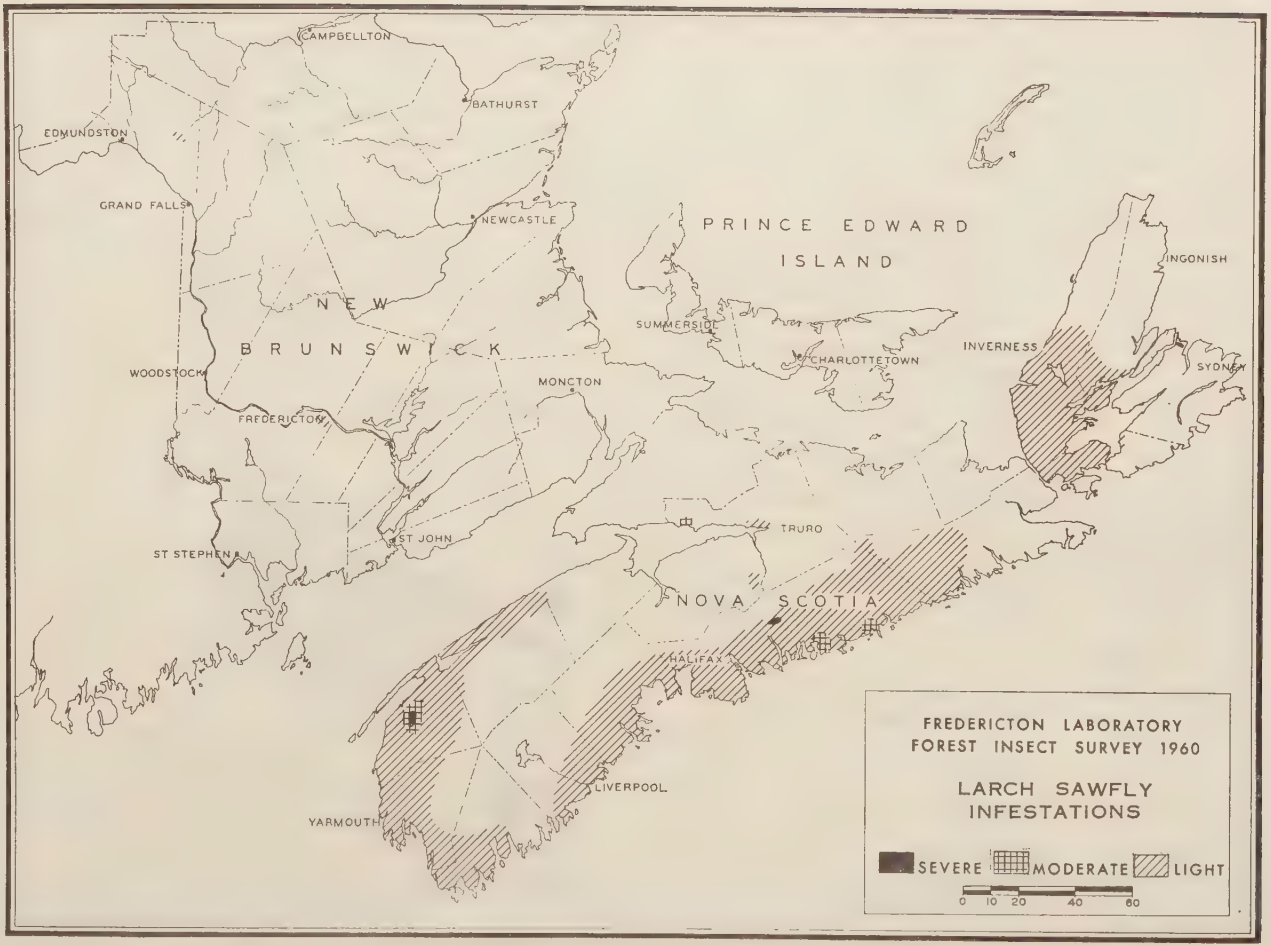
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FREDERICTON LABORATORY
FOREST INSECT SURVEY 1960
LARCH SAWFLY
INFESTATIONS
SEVERE
MODERATE
LIGHT
0 10 20 40 60

MARITIME PROVINCES

FOREST DISEASE SURVEY

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INTRODUCTION

The damage caused by forest tree diseases in the Maritime Provinces during 1960 was generally less severe than during the previous two years. An adequate snow cover developed early and persisted throughout the winter. Consequently very little winter killing of broad-leaved trees and shrubs occurred and winter drying of conifers was less prevalent than in 1959. Damage from freezing rains occurred only in small, localized areas. May was warm and dry with plant growth beginning earlier than usual. Late frosts occurred in June but damage was light. Weather conditions during June and July were close to normal, but August and September were exceptionally dry. In September, Hurricane 'Donna' passed over the Maritime Provinces but damage was confined to the breaking or uprooting of scattered trees only, most of which were decayed or cankered.

A total of 319 collections of diseased material was handled during the year. Samples were again collected to determine the fungi causing decay and damping-off of various tree species but these are not included in the total. Numerous reports of disease conditions were also received from Survey staff.

The Dutch elm disease survey was again conducted jointly with the Plant Protection Division, Saint John, N.B. Members of the Plant Research Institute, Ottawa, assisted with the identification of fungi. Dr. O. Vaartaja, formerly at the Forest Biology Laboratory, Saskatoon, kindly identified isolates of damping-off fungi.

IMPORTANT DISEASES

Ice Storm Damage—A freezing rain on Cape Breton Island in March was responsible for many broken tops of dominant and co-dominant balsam fir trees on North Mountain Plateau, and to a less extent on the plateaus of MacKenzie and French mountains.

In New Brunswick, approximately 50 per cent of the trees in a young jack pine stand west of Red Bank, Northumberland County, were also storm damaged. Approximately one half of the damaged trees were killed.

Frost Damage—Damage from late frosts occurred in New Brunswick and Nova Scotia. The heaviest damage observed was at Murphy Cove and Mooselands, Halifax County, N.S., where up to 90 per cent of the new foliage of red spruce reproduction was injured. Elsewhere in Nova Scotia light damage was reported to balsam fir and spruce reproduction at various points in Cape Breton Island and the northern mainland, and to beech and sugar maple reproduction at North Earltown, Colchester County.

In New Brunswick, light damage to spruce reproduction was reported from Albert, Gloucester, and Madawaska counties. During spruce budworm surveys, light damage to the new shoots of balsam fir was observed in Carleton, Northumberland, Queens, Restigouche, Victoria, and York counties.

Winter Drying of Conifers—Winter drying of conifers, particularly red and jack pines, was common in Nova Scotia during June, but heavy damage was observed only in the Annapolis Valley.

In Prince Edward Island, noticeable, but light, damage occurred in red pine plantations in Queens County.

Drought Injury—The dry conditions that prevailed throughout most of the Maritime Provinces during August and September were responsible for the early autumn coloration of the foliage of broad-leaved trees and, at some places, for premature leaf fall.

Dutch Elm Disease—In 1960, the Dutch elm disease survey was restricted to areas in which diseased trees had not been found or had not previously been numerous. The causal fungus, *Ceratocystis ulmi* (Buism.) C. Moreau, was isolated from 75 of the 90 suspect elms sampled. Diseased trees were located for the first time at 15 additional localities in New Brunswick as follows:

Carleton County
- Beechwood
- Cloverdale

Victoria County
- Andover
- Cliffordvale
- Four Falls
- Ortonville

York County
- Burtt's Corner
- Dumfries
- Hawkshaw
- Lower Southampton
- Meductic
- Penniac
- Stanley
- Upper Southampton
- Zealand Station

This brings the number of localities in which diseased trees have been found to 44 (see map). Of these, 20 are in Carleton County, 1 in Sunbury County*, 10 in Victoria County, and 13 in York County. The disease is now known to occur in the St. John River Watershed from 10 miles below Grand Falls, Victoria County, to Upper Lincoln, Sunbury County.

Anthracnose of Maple—The causal fungus of this disease, *Gloeosporium apocryptum* Ell. & Ev., was responsible for considerable browning of the leaves of sugar maples and, occasionally, of red maples in Gloucester, Northumberland, Restigouche, Victoria, and York counties, N.B. For the second consecutive year, heavy defoliation occurred in northern York and southern Northumberland counties. At other locations, defoliation was light.

Willow Blight—Early in the summer, damage from willow blight, *Fusicladium saliciperdum* (All. & Tub.) Lind. and *Physalospora miyabeana* Fuk. was severe in the Annapolis Valley and central part of Nova Scotia and heavy along the St. John and Nashwaak Rivers in New Brunswick. Probably because of dry weather, the leaves produced during the summer escaped attack and by late summer the trees appeared healthy.

Ink Spot of Aspen—Ink spot of aspen, *Ciborinia whetzelii* (Seav.) Seav., was observed at widely separated points in New Brunswick but the infections were generally light. The heaviest damage reported was at localities in Northumberland, Restigouche, and Sunbury counties, where 50 per cent or more of the foliage was affected on some trees.

In Nova Scotia, the disease was reported as heavy on a few trembling aspen trees near Debert, Colchester County.

*In the 1959 Report, Upper Lincoln was inadvertently placed in York County instead of Sunbury County.

Leaf and Twig Blight of Poplar—This disease of trembling aspen caused by *Pollaccia radiosa* (Lib.) Bald. & Cif. occurred throughout the Maritime Provinces but infections were light.

Ash Rust—Ash rust, *Puccinia sparganioides* Ell. & Barth., was again responsible for severe damage to the foliage of ash in southern Queens County, N.S.

Leaf Blotch of Horsechestnut—The browning of horsechestnut leaves characteristic of this disease caused by *Guignardia aesculi* (Peck) Stew. was common and conspicuous throughout western Nova Scotia in August.

Needle Rusts of Spruce—Needle rusts, *Chrysomyxa* spp., were common on white and red spruce trees in Nova Scotia and heavy infections of new needles occurred in Colchester, Guysborough, Halifax, Queens, and Shelburne counties.

In New Brunswick, heavy infections were observed in Queens, Restigouche, and Westmorland counties.

Needle Cast of Spruce—Needle cast, probably caused by *Lophodermium filiforme* Darker, was common on the 1959 needles of red spruce in Nova Scotia and heavy attacks were reported in Colchester, Cumberland, Digby, Halifax, and Hants counties.

Tip Blight of Balsam Fir—Occasional blighted shoots caused by *Rehmiellopsis balsameae* Waterman were observed on balsam fir in Nova Scotia from Kempt Road through Grand River and Loch Lomond, Richmond County, to Enon, Cape Breton County.

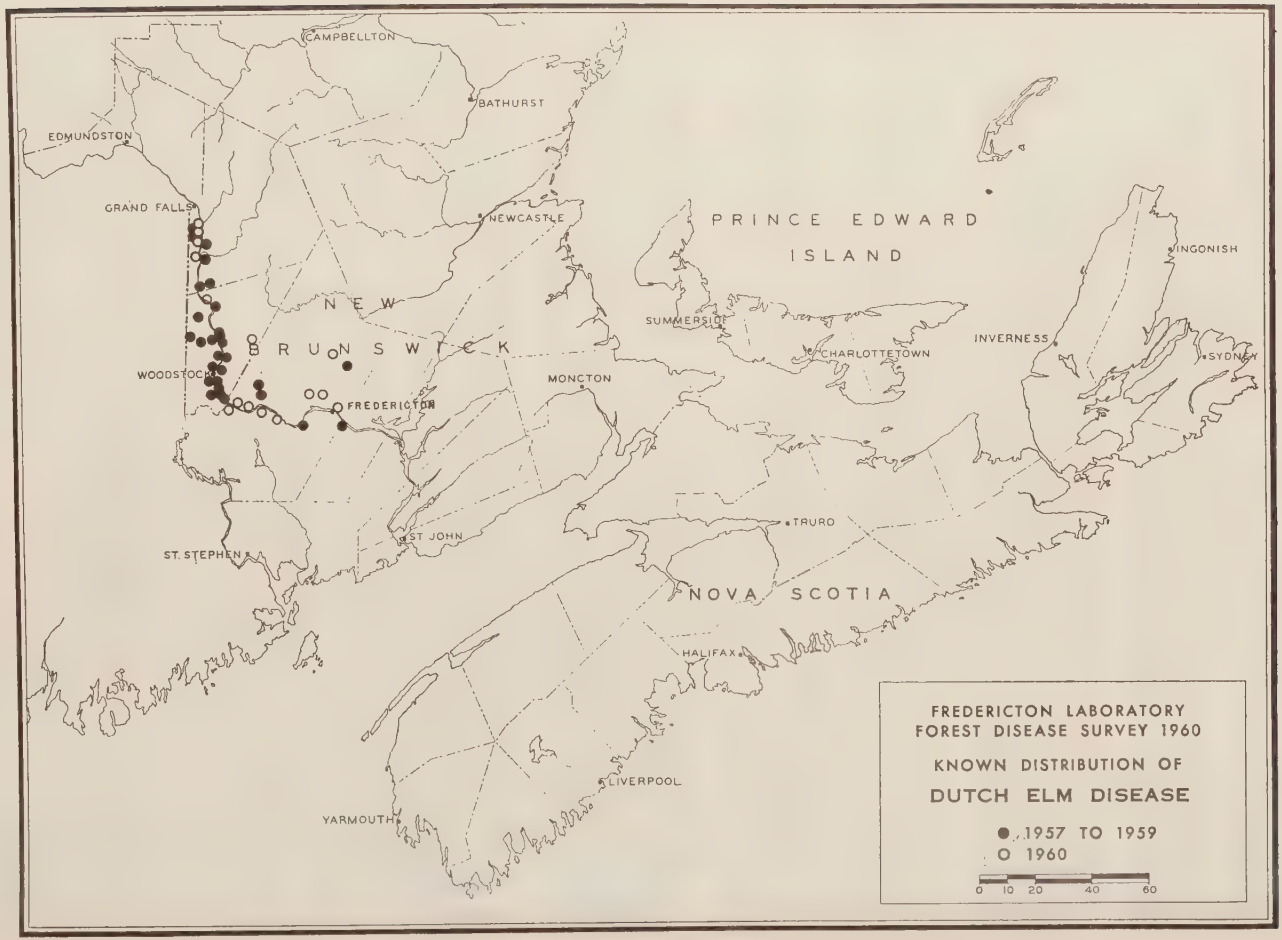
Red Flag of Balsam Fir—In Nova Scotia, this condition believed to be mainly the result of branch cankers caused by the fungus, *Fusicoccum abietinum* Prill. & Delacr., was common throughout the area from Frizzleton, Inverness County, to Middle River and West Middle River, Victoria County; along Route 4 from Cleveland, Richmond County, to East Bay, Cape Breton County; and between Upper Musquodoboit and Sheet Harbour, Halifax County.

Eastern Dwarf Mistletoe—The eastern dwarf mistletoe, *Arceuthobium pusillum* Peck, caused damage to species of spruce in Guysborough, Halifax, Inverness, Queens, Richmond, Shelburne, and Victoria counties, N.S. The plant was responsible mainly for stunting and deforming trees but in some areas dead and dying branches or trees were evident.

In New Brunswick some stunting of spruce was observed near Barton, York County, Port Elgin, Westmorland County, and Sevogle, Northumberland County.

OTHER NOTEWORTHY DISEASES

Host	Organism	Locality	Remarks
Oak, red	*Gloeosporium cinerascens* Bub.	Aylesford, N.S.	Causes anthracnose. First record for district.
Cedar, northern white	*Didymascella thujina* (Durand) Maire	Plaster Rock-Renous Hwy, N.B. Miscouche, P.E.I.	Causes a leaf blight. First record for district.
Cedar, northern white	*Lophodermium thuyae* Davis	McAdam, N.B.	Causes a needle spot. First record for district.
Pine, mugho	*Rhizoctonia solani* Kuehn	Ripples, N.B.	Causes damping-off. First Survey record.
Pine, red	*Pythium debaryanum* Hesse	Ripples, N.B.	Causes damping-off. First Survey record.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CHARLOTTETOWN
INVERNESS
SYDNEY
WOODSTOCK
MONCTON
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YARMOUTH
FREDERICTON LABORATORY
FOREST DISEASE SURVEY 1960
KNOWN DISTRIBUTION OF
DUTCH ELM DISEASE
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PROVINCE OF QUEBEC

FOREST INSECT SURVEY

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INTRODUCTION

Forest Insect Survey activities in Quebec were continued on the same basis as the past five years with the activities related directly to spruce budworm conditions or to specific research projects of the Laboratory. The field season was not particularly favourable for insect development; spring came early but weather remained relatively dry throughout most of the summer with the exception of two weeks in July. Conditions returned to normal in September.

No important change was recorded in the spruce budworm situation and the population level remained low except in certain residual outbreak areas where insect numbers increased markedly. The Swaine jack-pine sawfly was less abundant in several outbreak areas but new increases were recorded in some localities of the Lake St. John region. The larch sawfly is presently the most important forest insect in Quebec; some decrease in numbers was recorded in the western regions but medium to severe infestations are now relatively common in central Quebec. The status of the European spruce sawfly is comparable to that of 1959. In contrast, the fall webworm has increased considerably and was found more commonly south of the St. Lawrence River. The appearance of the gypsy moth in southern Quebec in sufficient numbers to necessitate aerial spraying was also unusual. In 1960, the Quebec Laboratory again participated in a co-operative egg survey in southern Quebec. An area of 2,100 square miles was covered and new areas of infestation were found which may require spraying in 1961.

This report summarizes the various conditions observed by the Survey staff and the research officers of this Laboratory. The information received from the various project leaders is gratefully acknowledged.

IMPORTANT INSECTS

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—Changes in the status of the spruce budworm in 1960 were limited to residual outbreak areas where severe defoliation occurred. This resurgence has been attributed to an abnormally high survival of budworm larvae due to exceptionally favourable developmental conditions. The months of May and June were hot and dry and there was an abundance of staminate flowers on balsam fir and spruce. Increased abundance was reported for several areas in eastern Quebec. On the North Shore of the St. Lawrence River, foci were recorded in the Lower Saguenay watershed and west of the Outardes River in Saguenay County. Observations by Survey staff revealed the same situation in the Shipshaw and HaHa river areas; the light to medium defoliation of previous years became severe in 1960. Other areas where population increases were reported included sectors of the St. Marguerite, Laval, Bersimis, and Outardes watersheds.

In the Lower St. Lawrence and Gaspe regions where population levels have been followed closely for a number of years, a defoliation survey revealed no defoliation except in and around the Kedgwick and Mistigougeche infestation

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areas reported in 1959. In the latter areas, larval counts made early in the spring showed the situation to be worse than expected and recommendations for spraying an area of 30 square miles were made in lieu of the 10 square miles anticipated in the fall of 1959.

An egg survey in the fall of 1960 covered an area of approximately 300 square miles. Of the 44 localities sampled, 10 were located inside the sprayed area and 70 per cent gave negative results. Budworm egg masses were found at 62 per cent of the remaining sampling points outside the sprayed area and 26 per cent gave high egg counts. These high counts were located in two different blocks adjacent to the area sprayed in 1960, one of approximately 40 square miles to the east and the other of 55 square miles to the west. Part of these blocks were sprayed in 1954 and 1955. High population levels can be expected in these areas in 1961 and spraying has been recommended.

Swaine Jack-pine Sawfly, *Neodiprion swainei* Midd.—In 1960, special surveys were extended into the accessible jack pine areas east of the St. Maurice watershed not visited since 1956 and 1957. Observations were made at 59 sampling stations previously established and egg cluster counts were made in the moderate and severe infestation areas. In the Saguenay watershed, sawfly collections were restricted to within a 60-mile radius of Lake St. John and all severe infestations were within 30 miles of the Lake. The most important was located in Falardeau Township near Lake Brochet, where spraying experiments with a virus disease were carried out in 1960. The infestation previously recorded in Tremblay Township was much reduced by extensive cutting by settlers, yet an average of 11 colonies were counted on the remaining trees. No extension has been recorded for the Riviere a Mars infestation. Other known outbreaks either collapsed or suffered marked reductions in population level due to extensive clear cutting. The Rat River infestation, which has been active since 1940 in some parts of the watershed, appears to be over. The same conditions prevailed in the long standing infestation along the Ouiatchouanish River.

East of the Saguenay watershed, only small numbers of the jack-pine sawfly were found. New localities where sawfly occurrence has not been reported previously include the Sault au Cochon and Outardes rivers on the North Shore of the St. Lawrence River and St. Alexandre, Kamouraska County, on the South Shore.

Observations and information from areas in western Quebec indicate that population levels have decreased considerably. In the St. Maurice infestation area, colony counts declined from 30 to 6 per tree.

Larch sawfly, *Pristiphora erichsonii* (Htg.)—This important pest of larch is now the most abundant forest insect in Quebec. Reports came from all regions and varying degrees of defoliation were observed throughout the more accessible forest areas. The insect was also collected as far north as Mistassini Lake in central Quebec and the 51° 30′ parallel of latitude on the Manicouagan River. A decline in population level was apparent in the Abitibi region of northwestern Quebec where the insect had been very active for a number of years. At the same time, very noticeable increases were recorded in the more recently infested regions of central Quebec. The severity of the attack was often irregular but severely defoliated stands were quite common. New areas of light to medium infestation were observed in eastern Quebec where defoliation had not previously been apparent. Sequential sampling* at the 15 localities reported in 1959 and at 22 new localities in recently invaded areas are presented in the following table.

*Ives, W. G. H. and R. M. Prentice, 1958. A sequential sampling technique for surveys of the larch sawfly. Can. Ent. 90:331–338.

Region	No. Localities Sampled	Degree of Infestation			Trend 1960
		Light	Moderate	Severe	
Abitibi	5	2	1	2	decrease
LaVerendrye Park	2	1	—	1	no change
North Montreal	6	3	1	2	no change
Chibougamau Road	4	3	—	1	increase
Lake St. John-Saguenay	4	1	3	—	increase
Laurentide Park-Charlevoix	4	1	—	3	increase
Quebec area	7	6	—	1	increase
Lower St. Lawrence	5	5	0	0	increase

Two species of parasite have been recovered from the rearings to date, *Mesoleius tenthredinis* Morley and *Bessa harveyi* (Tnsd.). Although parasitism increased during the last two years at sample points in the Abitibi region, it is generally less than 20 per cent. The few samples taken in the areas of newer infestation to the south and east of La Verendrye Park show that parasitism was less than 5 per cent. Dead larvae were observed in areas of reduced population level but no disease organisms were identified.

Gypsy Moth, *Porthetria dispar* (L.)—Males of this insect were captured in southern Quebec during the summer of 1955 and a co-operative egg survey was begun in areas surrounding the positive traps by the Plant Protection Division, Canada Department of Agriculture. This survey has been repeated each fall. One egg-mass was found in 1956 and very small numbers each succeeding year until 1959 when a great increase in egg counts was observed and three infestations were definitely localized. The largest was near St. Clothilde, Chateauguay County. Another was south of St. Chrysostome in the same county and the third was near Havelock Corner, Huntingdon County. As a preventive measure, approximately 2,000 acres covering these three infestations and nearby hazard areas were sprayed with insecticides by aircraft in May, 1960.

Traps were re-established in southern Quebec during the summer of 1960 to cover an area of over 2,100 square miles. Male moths were captured in greater numbers and over a much wider area than in past years. An egg survey in the fall revealed three new infestations which will probably be sprayed in 1961.

European Spruce Sawfly, *Diprion hercyniae* (Htg.)—Larval sampling was much reduced this year and limited to late instar larvae to provide information on larval parasitism. However, these samples showed that larval abundance in 1960 was about the same as in 1959. The insect was easily found on young white spruce trees, but always in low numbers. As in previous years, some larvae died from disease. Larval parasitism was 9 per cent for the first generation and only one species of parasite, *Drino bohemica* Mesn., was obtained. Records for the second generation are not yet complete but a species of *Exenterus* was also recovered. Cage experiments during the last two years have shown that considerable mortality occurs in the egg stage and that a third generation was completed, 20 miles south of Quebec City, during the summer of 1959.

European Pine Shoot Moth, *Rhyacionia buoliana* (Schiff.)—The population level of this pest of Mugho pine remained low in 1960, in spite of comparatively favourable winter conditions. Winter mortality was estimated at approximately 50 per cent, the minimum yet recorded, but parasitism increased

considerably and probably prevented an increase in abundance. Parasitism based on total emergence reached 80 per cent; *Orgilus obscurator* (Nees) and *Temelucha interruptor* Grav., two species of European origin, were the most important parasites.

Red-headed Jack-pine Sawfly, *Neodiprion virginianus* complex—This insect was recorded in several new localities in the Lake St. John region in 1960, often associated with *N. swainei.* This sawfly was also common near Lake McLaren on the St. Maurice watershed. In the previously known Settrington Township infestation, the population level decreased considerably in 1960. Approximately 30 per cent of the trees were affected and only 5 per cent had more than one colony per tree. Defoliation was noticeable only by careful observation.

Egg mortality was important again this year and parasitism was generally high. Seven species of larval parasites were recovered in 1959, *Spathimeigenia* sp. being the most important. Experiments with planted cocoons also showed that a considerable number are destroyed through predation by small mammals. Partial emergence of a second generation was observed and some of the larvae produced completed their development this fall.

Larch Casebearer, *Coleophora laricella* (Hbn.)—Sequential sampling* in in the spring of 1960 showed slight decreases in population level throughout the Plains of the St. Lawrence River and the Eastern Townships. The degree of infestation varied from 'trace' to 'light'. The casebearer was found throughout central Quebec as far north as Senneterre, Abitibi County, and the Lake St. John region. In these northern regions, population levels were extremely low. Parasitism based on total emergence, ranged from 6 to 58 per cent for 18 localities. The most important parasites were *Agathis pumila* (Ratz.) and *Epilampsis laricinellae* (Ratz.). *A. pumila* was found in the Abitibi region in spite of the low host numbers. Bird predation on overwintering larvae also appears as an important control factor especially in the Eastern Townships.

Maple Leaf Cutter, *Paraclemensia acerifoliella* (Fitch)—Reports of damage by this insect were less abundant this year. The infestations reported in Brome and Stanstead counties in 1959 continued; the level of infestation varied considerably but no severe defoliation was observed. In the sugar maple stands of St. Benoit du Lac reported as heavily infested in 1959, the insect was abundant only on the margin of the stands. Fifty per cent of the leaves were affected and most of them had only one case.

Poplar Sawfly, *Trichiocampus viminalis* (Fall.)—The population level of the poplar sawfly in the Quebec City area in 1960 was found to be extremely low for the third consecutive year. Appreciable numbers were found in only one locality, Montmorency Falls (Quebec County), on Lombardy poplar. However, numbers declined considerably in early August owing to the virus disease observed in previous years. This insect occurs widely throughout eastern Quebec and has recently been collected at St. Felicien, Roberval County, and at Batiscan, Champlain County. No infestations are known at present; apparently the disease is the main control factor.

Poplar Leaf Miner, *Phytagromyza populicola* (Hal.)—Special sampling for this species was extended in 1960 to many localities within a 100-mile radius of Quebec City. The records show that the insect was present throughout the area and as far north as Lake St. John. The percentage of leaves affected, based on

*Webb, F. E., 1957. Sampling techniques for the overwintering stage of the larch casebearer. Bi-Mon. Prog. Rept. Div. For. Biol., Dept. Agr., Can. 13 (4).

samples taken from the lower crowns of Lombardy poplar, varied from 20 to 55 with the highest counts coming from the Plains of Three Rivers Region.

Fall Webworm, *Hyphantria cunea* (Drury)—The fall webworm was more common in 1960 than in previous years. Nests were conspicuous along roadsides particularly south of the St. Lawrence River and west of the Chaudière River. Webs were observed on various tree species and especially on elm, alder, pin cherry, and willow. Several nest tallies were made in southern Quebec and the highest concentrations were found in Levis and Lotbinière counties. The average number of nests per mile of road in this region was 36 and the maximum 61.

Bruce Spanworm, *Operophtera bruceata* (Hulst)—The Bruce spanworm was reported from a hardwood stand near St. Aubert, L'Islet County, in the fall of 1960. The degree of infestation was light on the basis of the number of males seen in flight and the females observed on the trunks of sugar maple and trembling aspen trees.

Pitch Nodule Maker, *Petrova albicapitana* (Busck)—Information on the pitch nodule maker was obtained along with the records of the jack-pine sawfly. The insect was observed throughout the range of jack pine sampled to date. No important damage was found except on Grand Calumet Island, Pontiac County, where injured twigs were recorded as being very abundant in 1957. A slight decrease occurred in 1960.

Pine Needle Scale, *Phenacaspis pinifoliae* (Fitch)—Several samples of this pest of ornamental spruce were received during 1960, especially from localities in the St. Lawrence Valley between Montreal and Tadoussac. White spruce trees at St. Nicolas, moderately infested a few years ago, were sampled in 1960 to obtain adults of *Chilocorus stigma* (Say) a coccinellid predator of scale insects. Intensive sampling produced only one adult specimen.

Balsam Shoot-boring Sawfly, *Pleroneura borealis* Felt—This insect was common on the new shoots of balsam fir near St. Roch de Mekinac, Laviolette County, and between Nicolet and Sorel along the St. Lawrence River. It was also recorded at Charlesbourg near Quebec City.

Green Spruce Leaf Miner, *Epinotia nanana* Treit.—This imported pest of spruce has been common in the Berthierville area for a number of years. The population level has increased considerably since 1957 and reached a maximum in 1959. It was again abundant in 1960 but a reduction was apparent. Only small numbers of a few species of parasites were recovered from rearings.

Oak Defoliators—Light to medium defoliation was again observed in red oak stands in St. Foy and Cap Rouge near Quebec City. Defoliation varied considerably between trees ranging from 'trace' to approximately 40 per cent. Several insects were responsible for the damage but only two were identified to species i.e. *Argyrotoxa semipurpurana* Kft. and *Argyrotaenia quercifoliana* Fitch. The former represented 80 per cent of the total insect population.

Cicada on White Spruce, *Tibicen canicularis* Harr.—An outbreak of this insect was reported in a white spruce plantation near Grand' Mère in 1960. Nymphal skins were noted near the base of dead and dying trees in poor white spruce areas. No signs of insects were found in better stands or in any of the nearby Scots or jack pine plantations. The nymph population level was estimated at approximately four per square foot in the outbreak areas. Nymphal skins were observed in 1958 and 1959 in another section of the plantation but were considerably less abundant.

Insect	Hosts	Locality	Remarks
Adelges cooleyi (Gill.).....	Spruce, blue	St. Anne, Chicoutimi Co.	Moderate infestation in Gagnon nursery.
Altica ulmi Woods.....	Elm	Seigniory Club, Papineau Co.	Several trees severely defoliated.
Archips cerasivoranus Fitch...	Cherry, choke	Eastern Townships and Quebec area	Moderate to severe infestation in several counties.
Cyllene robiniae Forster.....	Locust	Sillery, Quebec	Many ornamental trees seriously affected.
Diprion frutetorum (F.).....	Pine, Scots	Shawinigan, St. Maurice Co.	Low incidence.
Diprion similis (Htg.).....	Pine, Mugho	St. Therese, Terrebonne Co.	Trace; last recorded on same species at Montreal Botanical Garden in 1956.
Dioryctria abietivorella (Grote).	Pine, Mugho	Chicoutimi	Moderate infestation in nursery stock.
Eriosoma lanigerum Hausm....	Elm, white	Quebec area	Fairly common throughout Greater Quebec.
Eriocampa ovata (Linn.).....	Alder	St. Augustin, Portneuf Co.	Light infestation.
Evagora piceaella Kft.....	Spruce, white	Berthierville, Berthier Co.	Pockets of severe infestations.
Fenusa pusilla (Lep.).....	Birch, white and grey	Central and western Quebec	Common throughout the district.
Itonida ocellaris (O.S.).....	Maple, red	Quebec City and Thetford Mines	Ocellate gall commonly found.
Neodiprion pratti banksianae Roh.	Pine, jack	Chateau d'Eau, Montmorency Co.	Again present in area reported in 1959.
Phyllophaga anxia Lec.....	Pine, red	Metabetchouan, Roberval Co.	Root injury on young transplants.
Phyllophaga drakei Kby.....	Spruce, white	Grand'Mère, St. Mauricie Co.	Fairly abundant in 30-year-old plantation.
Pineus strobi (Htg.).....	Pine, white	Cap Rouge, Quebec Co.	On pines infected with blister rust
Pissodes approximatus Hopk.	Spruce, blue	Cowansville, Missisquoi Co.	Serious damage on several 20-year-old ornamental trees.
Ropalopus sanguinicollis (Horn)	Cherry, pin	St. Jean Port-Joli, L'Islet Co.	Moderate to severe infestation.
		Quebec City area	Light infestation.
Zeiraphera fortunana Kft.....	Spruce, white	Charlevoix County, Lower St. Lawrence and Gaspe	Common with pockets of light to moderate infestation.
Zeiraphera ratzeburgiana Ratz.	Spruce, white	Gaspe Peninsula	Very common.

PROVINCE OF QUEBEC

FOREST DISEASE SURVEY

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INTRODUCTION

An ice storm in early spring and a prolonged summer drought caused considerable damage to trees in Quebec in 1960. Needle rust infections were heavy on some conifers, especially spruce, in most of the areas surveyed. The number of collections increased in 1960 and several new disease and fungus records were made. Many requests concerning diseases of trees or shrubs were answered during the year.

The collections and reports submitted by cooperators, research officers, and other members of the Laboratory are gratefully acknowledged.

The collections were distributed among the host trees as listed below. Under miscellaneous hosts are included the collections of rusts on alternate hosts.

Coniferous Trees	Collections	Broad-leaved Trees	Collections
Balsam fir	54	Poplar	22
Jack pine	37	Willow	14
Black spruce	20	Maple	14
White spruce	15	Birch	6
Red pine	7	Mountain ash	3
Scots pine	5	Others	36
Colorado blue spruce	4		—
Eastern white cedar	3	Total	95
Red spruce	2		
White pine	2		
Others	13		
Total	162	Miscellaneous hosts	100
Grand Total	357		

IMPORTANT DISEASES

Ice Damage—Heavy freezing rains at the beginning of April produced a 1- to 2-inch-thick layer of ice on trees. A considerable number of branches and crowns of deciduous trees, particularly poplars, maples, white birch, and American elm, were broken under the weight of ice.

The Quebec City region was the most severely affected by this storm particularly at the following points: Quebec City, Island of Orléans, St. Nicolas, St. Romuald and Lévis, an area south of Lévis, extending from St. Henri to Ste. Marie, Beauce County, and an 8-mile-wide band extending from Lauzon to L'Islet. Damage was moderate to heavy in a 1-mile-wide band extending from east of Quebec to Beaupré and in Baie St. Paul, and moderate to light in a 5-mile-wide zone extending from west of Quebec to Cap-de-la-Madeleine, and also from L'Islet to below Rivière-du-Loup.

Although the storm extended as far south as Sherbrooke and Thetford Mines on the south shore west of Quebec, little or no damage was observed in these districts.

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Needle Yellowing—A chlorosis of 1-year-old needles was noticed on balsam fir, pine, and spruce trees around Quebec City and on Mugho pine in Metabetchouan, Lake St. John.

Bark Cracking —The circumferential bark cracking of balsam fir branches reported in 1959 caused the death of the branches which were invaded by *Cytospora friesii* Sacc. No new cracking was observed in 1960 which suggests that the condition was caused by climatic factors.

Needle Distortion —The white spruce trees at Drummondville (not Grand'Mère as reported in 1959) that showed abnormal shoot and needle growth last year have in 1960 produced normal appearing axillary shoots at the base of the shoots affected in 1959.

A similar abnormal development of needles and shoots was observed in 1960 on several 7- to 8-year-old white spruce plantings at St. Narcisse, Lotbinière County. The needles were twisted, conspicuously flattened, and light green in colour. Needles developing prematurely on buds formed in 1960 were also characteristics of this aberration. Most of the affected trees had a very bushy appearance.

Frost Damage—Severe late frost affected the foliage of sugar and mountain maples near Ste. Anne de la Pocatière, Kamouraska County.

Late frost was reported to be general on spruce and balsam fir near Lake St. Joseph, Portneuf County, and north of La Tuque, Laviolette County.

Necrotic Spots on Conifers—Numerous necrotic spots were observed on the 1- to 3-year-old needles of several jack pine trees at Ste. Agnès, Charlevoix County, and at Les Escoumains, Saguenay County, and of many balsam fir trees at Sault-aux-Moutons, Saguenay County. No fungi could be associated with these spots, and the cause of this necrosis is yet unknown.

Chlorotic Spots on Maple—At the Berthierville nursery, large yellow spots were general on the leaves of approximately 200 red maple saplings. Although an *Alternaria* was frequently isolated from such spots, it is questionable whether this fungus was responsible for the disease.

Yellowing on Caragana—Approximately 200 young caragana plants at the Drummondville Nursery showed a general mosaic-like chlorosis and wrinkling of the leaves. Some of the plants showed signs of recovery by August. The symptoms suggest a virus disease.

Maple Decline—Drought and other unfavourable environmental conditions probably account for the dwarfing, scorching, and premature leaf-fall observed on many maples in the Quebec, Montmagny, and Montreal regions. Numerous maples planted along Routes 9 and 11 leading from Montreal to Laprairie and Valleyfield, respectively, had shed their leaves by the end of August. It is possible that calcium salts used on the roads in the winter contributed to this condition.

Dieback symptoms were observed on a few maple trees in St. Romuald, Lévis County, and Quebec City. In St. Romuald, dying of twigs had started as early as 1952 on a mature sugar maple, and apparently had progressed geometrically thereafter. This tree showed typical wilt symptoms with dwarfed and often necrotically spotted leaves on some branches, while adjacent branches appeared normal. A discoloration of the pith in twigs affected in 1959 had spread through the nodes into the current shoots which were dying. This successive dieback often gave rise to the formation of small witches' brooms. *Pullularia* sp. and *Alternaria* sp. were the principal organisms isolated from the discoloured areas, but no

organisms were isolated from the apparently healthy wood below. In Quebec City, a similar dying of twigs originating in 1953, 1956, and 1958 was observed on a group of three sugar maple trees. Leaf symptoms, except for the absence of acute wilting, were similar to those described for the tree in St. Romuald. *Stegonosporium pyriforme* (Hoffm. ex Fr.) Corda was observed fruiting on dead branches, but in one case, on a branch which still had green leaves.

Tip Blight—The two *Abies concolor* Lindl. trees on which *Rehmiellopsis basalmeae* Waterman was discovered in 1959, for the first time in Quebec, were reinfected by this organism in 1960. Careful surveys have not yet found this pathogen on balsam fir.

Needle Casts—Needle casts caused by *Hypodermella ampla* (Davis) Dearness were abundant on jack pine trees at St. Urbain, Charlevoix County, at Cap-de-la-Madeleine, Champlain County, and near Chapeau de Paille, St. Maurice County.

Another needle cast caused by *Hypodermella medusa* Dearness was common on jack pine trees at Sault-aux-Moutons, Saguenay County. As far as can be determined, this is the first record of the fungus in Canada, and its first record on jack pine.

Stem Rusts—In stands at St. Hilarion and St. Siméon, Charlevoix County, at Cap-de-la-Madeleine, Champlain County, and in a plantation in Quebec City many young jack pine trees were killed or seriously infected by the globose gall rust caused by *Peridermium harknesii* J. P. Moore. This rust was also observed infrequently on young jack pine stands near Forestville, Saguenay County, and Chapeau de Paille, St. Maurice County.

One or both of the following alternate hosts of this rust, *Melampyrum lineare* Desr. and *Rhinanthus crista-galli* L., were present in most of the stands surveyed. Heavy infection of these hosts, particularly of *Melampyrum*, was observed in the above localities, except Chapeau de Paille.

Numerous Scots pines were lightly to severely infected by the Woodgate rust in plantations at Grand'Mère and the Proulx Nursery, at St. Jovite, Terrebonne County, and at Shannon and Ste. Catherine, north of Quebec City.

Needle Rusts—Heavy rust infections, sometimes involving 90 per cent of the current year's needles, were observed on spruce trees in 1960. *Chrysomyxa ledicola* Lagerh. was the most common pathogen. At Proulx, 70 to 90 per cent of the 1960 foliage of approximately 200 Colorado blue spruce trees was infected by this rust. Moderate to heavy infections were noticed on black spruce trees in the following regions: Chapeau de Paille and Weedon, Wolfe County; southeastern Laurentide Park; Waconichi Lake, Roberval County; Ste. Anne River and St.-Tite-des-Caps, Montmorency County; St. Hilarion, Charlevoix County; and Les Escoumains, Saguenay County. Moderate to heavy infections were noted on white spruce trees growing in some of the above localities and in the Port-Alfred region, and also on red spruce trees at St. Etienne, Lotbinière County. *Chrysomyxa ledi* de Bary vars *ledi* Savile and *cassandrae* (Peck & Clint.) Savile were often found in the same localities on these spruce species, sometimes even on trees infected by *C. ledicola*. These two rust fungi caused a 60 to 90 per cent infection of the current year's foliage of a few Colorado blue spruces at Val-d'Or, Abitibi County.

At the end of the summer, heavy parasitism of the rust fungi by *Darluca filum* (Biv.) Cast., and by *Fusarium*- and *Cladosporium*-like fungi was observed.

Chrysomyxa empetri (Pers.) Schroët. caused moderate infections on white spruce in Tadoussac, in an area where heavy infections were observed in 1959.

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Chrysomyxa weirii Jacks. caused moderate infections on black spruce at L'Epaule in the Laurentide Park. This rust has not been found in areas other than those reported last year.

Although *Pucciniastrum americanum* (Farl.) Arth. was common in many areas on *Rubus idaeus* L., it was found only on white spruce in Baie St. Paul, Charlevoix County, where a moderate infection occurred.

Pucciniastrum geoppertianum (Kühn.) Kleb. was common on balsam fir at St. Urbain, Chapeau de Paille, St. Etienne, and Portneuf River, Saguenay County, where it caused light to moderate infections. Although *Pucciniastrum abieti-chamaenerii* Kleb. was common on *Epilobium angustifolium* L., no collections were made of the aecial stage on balsam fir.

Cone-Rust—*Chrysomyxa pirolata* Wint. infections were severe on the cones of some black spruce trees at Ste. Agnès and Pie-Sec, Charlevoix County.

Nectria Cankers—*Nectria galligena* Bres., frequently observed on birch and maple species, has been found during 1960 on American elm at St. Gilles, Lotbinière County, and on *Prunus virginiana* L. at St. Etienne, Lotbinière County. The fungus caused typical cankers in both instances.

OTHER NOTEWORTHY DISEASES

Host	Organism	Locality	Remarks
Amelanchier	*Phyllosticta innumerabilis* Pk.	St. Nicolas, Levis County	Causing a leaf spot. First herbarium record.
Arctostaphylos	*Chrysomyxa arctostaphyli* Diet.	St. Urbain, Charlevoix Co.	On *A. uva-ursi* L. First record in Quebec, and first herbarium record.
Ash	*Marssonina* sp.	St. Roch-des-Aulnaies, L'Islet	Associated with a leaf spot. First herbarium record, and probably first record in the Province.
Ash, mountain	*Isariopsis* sp.	St. Etienne, Lotbinière Co.	First host and herbarium records.
Aspen, trembling	*Tympanis spermatiospora* (Nyl.) Nyl.	St. Narcisse, Lotbinière Co.	First herbarium record.
Cedar, eastern white	*Keithia thujina* Durand	Sault-aux-Moutons Saguenay Co.	Heavy infection on a few trees.
Fir, balsam	*Amphisphaeria* sp.	Duchesnay, Portneuf Co.	Associated with a blue stain. A causal relationship is being investigated.
	Corticium galactinum (Fr.) Burt	Duchesnay, Portneuf Co.	Isolated from broken tops.
	Retinocyclus abietis (Crouan) Groves & Wells	Duchesany, Portneuf Co.	First host and herbarium records.
	Zythia resinae (Ehr. ex Fr.) Karst.	Duchesmay, Portneuf Co.	First host and herbarium records.
Hawthorn	*Podosphaera clandestina* (Wallr. ex Fr.) Lév.	Neuville, Portneuf Co.	Light infection on 500 *Crataegus crus-galli* L. plants in a nursery. First herbarium record.
Hemlock	*Pucciniastrum vaccinii* (Wint.) Jorstad	St. Nicholas, Lévis Co.	Low incidence, but general on *Vaccinium*.
Maple, red	*Comatrichia suksdorfii* Ell. & Everh.	St. Aubert, L'Islet Co.	Growing on living twigs. First herbarium record.
Sedge, Hougton's	*Puccinia bolleyana* Sacc.	Sault-aux-Moutons Saguenay Co.	Not yet collected on *Sambucus* in Quebec.
Spruce, black	*Chrysomyxa chiogenis* Diet.	Laurentide Park	Low incidence on spruce, but common on the alternate host.
Viburnum	*Coleosporium viburni* Arth.	St. Etienne, Lotbinière Co.	First herbarium record.
Willow	*Ciborinia foliicola* (Cash & Davidson) Whetzel	Ste. Anne River, Montmorency Co.	First record in Quebec and first herbarium record.
Yew	*Lepidoderma carestianum* (Rabenh.) Rostr.	Duchesnay, Portneuf Co.	First herbarium record.

PROVINCE OF ONTARIO

FOREST INSECT SURVEY

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INTRODUCTION

Continuation of medium to heavy infestations of the spruce budworm in northwestern Ontario and the recurrence of larch sawfly infestations in natural and planted stands of larch highlighted forest insect conditions in 1960. Another noteworthy feature was the extension of the known distribution of several introduced forest pests including the European pine sawfly, the introduced pine sawfly, the European elm leaf beetle, and the mountain-ash sawfly.

Although most species of forest insects showed little change in numbers from 1959, the following showed striking increases; the forest tent caterpillar, the eastern tent caterpillar, the black-headed budworm, the spring and fall cankerworms, the birch skeletonizer and the maple leaf cutter. Among species showing a marked decline in numbers were: the red-headed pine sawfly, the Swaine jack-pine sawfly, the large aspen tortrix, the walnut caterpillar, and the oak twig pruner.

The Forest Insect Survey is conducting biological studies on a number of forest insects. Among those receiving attention in 1960 were the taxonomy of needle miners and tube makers on pines, the life history of *Nepticula* sp. on birch, and the distribution and abundance of parasites attacking the European pine sawfly and the pitch nodule maker.

Insect collections in 1960 totalled 7,674, and because each collection usually contained more than one species, the actual number of insect samples was 11,735. The Forest Biology rangers submitted 6,973 collections independently and 471 jointly with co-operators. The number of collections are a useful guide in showing general trends in the relative abundance of major forest pests. Therefore the number of collections by forest district and region for the species discussed in the text are tabulated at the end of the text.

The Forest Insect Survey acknowledges the assistance of many individuals of the Department of Lands and Forests and of wood-using industries. They assisted in collecting field data and in providing essential services or equipment.

The collections were distributed among the principal host trees as follows:

Coniferous Trees	Collections		Broad-leaved Trees	Collections	
Pine			Poplar		
Jack pine	1,012		Trembling aspen	729	
Red pine	235		Balsam poplar	76	
White pine	152		Largetooth aspen	26	
Scots pine	159		Miscellaneous poplars	34	
Miscellaneous pines	12				865
		1,570			
Spruce			Oak		
White spruce	907		Red oak	96	
Black spruce	340		White oak	51	
Miscellaneous spruces	27		Miscellaneous oaks	63	
		1,274			210

Coniferous Trees	Collections	Broad-leaved trees	Collections	
Eastern white cedar	124	Birch		
Hemlock	30	White birch	645	
Tamarack	508	Yellow birch	29	
Balsam fir	475	Miscellaneous birches	14	
Juniper	29			688
Total	4,010	Elm		202
		Maple		
Miscellaneous hosts or hosts unspecified	133	Sugar maple	111	
		Red maple	44	
		Miscellaneous maples	41	
				196
		Cherry		425
		Willow		262
		Alder		239
		Mountain ash		122
		Walnut, hickory		43
		Ash		53
		Basswood		52
		Miscellaneous broad-leaved trees		174
		Total		3,531
Grand Total	7,674			

IMPORTANT INSECTS

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—The spruce budworm outbreaks continued in northwestern Ontario. In some districts infestation conditions were about the same as in 1959, but in others infestation levels declined or there were extensions into new areas; see accompanying map. The total area of moderate to severe infestation was about 6,500 square miles, a decrease of about 20 per cent from 1959. In the Sioux Lookout District, the infestation intensity over large areas showed a sudden decline paralleling the situation reported for other parts of northwestern Ontario in 1959. Defoliation was generally light from Sturgeon Lake south to Ignace, but scattered pockets of medium infestation occurred in the Ignace Division from White Otter Lake eastward to the Port Arthur District.

In the Kenora District, a relatively small area of heavy infestation occurred near Eltrut Lake on the Fort Frances–Kenora district border where defoliation of the current foliage amounted to about 90 per cent. The light infestation reported east of Lake of the Woods in 1959 subsided.

In the Fort Frances District, infestations were generally heavy from Rainy Lake eastward. Minor extensions in the boundary of severe defoliation occurred in the northern and northeastern parts of this district.

Infestations in the Port Arthur District extended about 6 miles farther eastward than in 1959 to Deatys and Arrow lakes. Also, light defoliation occurred in a band about 10 miles wide from Shebandowan Lake to Mountain Lake.

The area of heavy infestation in the southern part of Geraldton District was considerably smaller than in 1959, extending from Upper Roslyn Lake eastward to Ruffle and Prairie lakes, and covering about 500 square miles. South of this area defoliation was light except along the Gravel River and at Owl Lake where two pockets of moderate defoliation persisted.

Elsewhere in Ontario infestations were generally light. The infestations at Midhurst, Uxbridge, and an area along Highway 400 were classed as medium, light, and negligible, respectively. Pockets of light infestation were reported for the first time in recent years in a Norway spruce plantation in Woodhouse Township of the Lake Erie District, and on white spruce trees in a small stand in Lee-

son Township of the Chapleau District. Budworm larvae were collected in most forest districts as indicated by the summary table of insect collections.

A considerable increase in balsam fir mortality was observed in the districts of Sioux Lookout and Kenora. This was particularly apparent from the Town of Sioux Lookout east to Sturgeon Lake and thence south to Ignace; also in the Manitou lakes area. The appearance of these recently killed trees was different from typical mortality caused by successive years of defoliation. These trees had partially recovered from budworm attack and had produced foliage which turned reddish-brown in colour when death occurred. Although previous defoliation undoubtedly contributed to their death, other factors were apparently involved. White spruce trees continued to show more consistent recovery from budworm attack than balsam fir and in 1960 produced a heavy cone crop. Light mortality of defoliated host trees was observed in the western part of the Fort Frances District. A high percentage of the balsam fir has been killed in the Geraldton infestation.

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—Defoliation of tamarack was generally light to moderate with areas of severe defoliation restricted to individual stands or sizeable widely separated areas.

The upward trend in population levels reported in the Western and Midwestern regions in 1959 did not continue in 1960. Infestations declined in intensity in the Port Arthur District, showed little change in the Kenora District, increased locally in the Sioux Lookout and Geraldton districts, and generally increased to heavy intensity in the eastern part of the Fort Frances District. Infestation trends were equally diverse in the Northern Region. In the Kapuskasing District, infestations increased to heavy in the western half but generally were light in the eastern half. Tamarack stands in the Cochrane and Swastika districts were less severely affected than in 1959. Defoliation was light to moderate except for a heavy infestation in the watershed of the Abitibi River in the Cochrane District. In the Central Region, a slight decline in the number of medium and heavy infestations was noted in the White River, Sault Ste. Marie, Gogama, and Sudbury districts. Throughout the remainder of Ontario, incidence of the sawfly showed little change except for the severe defoliation of European larch in a number of county forests in the Lake Simcoe and Lindsay districts and new heavy infestations on part of the Bruce Peninsula and in the Kemptville District.

Two natural control factors may have been largely responsible for local population declines. Severe spring floods that occurred in parts of the Swastika and Cochrane districts in 1960 undoubtedly contributed to the mortality of stages that are susceptible to flooding. Also, large numbers of larvae were killed by pentatomid predators in many stands, particularly in the South Central Region.

In northwestern Ontario where the larch sawfly has caused appreciable defoliation for may years, tamarack trees produced short shoots and needles, and a subnormal complement of foliage. Some tree mortality has occurred.

European Pine Shoot Moth, *Rhyacionia buoliana* (Schiff.)—The relatively low infestation intensities of the European pine shoot moth that have prevailed in southern Ontario in recent years were again evident in 1960. In the Lake Huron District, heavy infestations were restricted to parts of Grey, Bruce, Huron, and Wellington counties and to two red pine plantations in the northern part of the Bruce Peninsula. Infestations in the Lake Simcoe District were generally classed as light. One infestation at Pontypool in the Lindsay District again caused severe damage. In the Lake Erie District, infestations increased to medium intensity on red pine nursery stock and in numerous red and Scots pine plantations. A heavy infestation was also reported at Sand Hill.

Dr. P. J. Pointing, who is conducting detailed studies on the shoot moth in southern Ontario, reported high egg population levels in the summer of 1960 on all study plots and much higher numbers of overwintering larvae than a year ago. Should the 1960-61 winter be unusually mild and otherwise favourable for larval survival, widespread and severe damage by the shoot moth could result in 1961.

Light infestations on red pine plantings near Algoma Mills and Ophir in the Sault Ste. Marie District were reported in 1960.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—Severe defoliation of broad-leaved trees in widely separated parts of northwestern Ontario and the Sudbury District may be the beginning of a new outbreak period of this defoliator. In the Kenora District, medium to heavy infestations were reported on a 4-acre island in Gunn Lake near Minaki and on four islands in Eagle Lake. In the Sioux Lookout District, defoliation was severe on an island in Moar Lake, 50 miles northwest of Red Lake. Other incipient populations were reported in all three districts of the Western Region; for example, Mr. E. P. Smereka, in conducting an intensive study of aspen insects along the Red Lake road, found three forest tent caterpillars in 1957, five in 1958, nine in 1959 and many in 1960. Two features of these observations recall the early stages of the last forest tent caterpillar outbreak period in Ontario in 1948 and 1949, namely: (a) Relatively high survival of the insect was indicated by appropriately timed mass collections, 44 per cent of the cocoons producing moths at Vermilion Bay and 69 per cent at Minaki; and (b) Female emergents predominated over males.

It is also of interest that three of the common parasites reared in 1960, *Sarcophaga aldrichi* Park., *Itoplectis conquisitor* (Say), and *Agria affinis* (Fall.) are also parasites of the spruce budworm.

A heavy infestation west of Sudbury, in a band 6 miles wide and 15 miles long, may have represented an extension of a small infestation first noted in 1959. This outbreak closely resembled a two-year-old infestation in that only 20 moths per 100 cocoons emerged and the sexes were more evenly divided.

Surveys based on the occurrence of overwintering egg-bands on host trees in northwestern Ontario indicate that the infestations described above will recur at similar or higher intensities and that widespread light defoliation will occur in 1961. In the Sudbury District, egg-band surveys point to slight expansion of the infestation in 1961 and further intensification of the infestation in the area affected in 1960. Highest egg-band counts were recorded in low quality stands of trembling aspen. Numbers of egg-bands on trees in the 4-to 6- inch diameter class averaged 30, 9, 8, and 2 in Snider, Denison, Rayside, and Blezard townships, respectively.

Light traps were operated at nine locations to ascertain the relative frequency of *Malacosoma* spp. adults in different parts. The results were as follows:

District	No. of moths captured		
	M. americanum	*M. disstria*	*M. pluviale*
Sioux Lookout	0	46	0
Geraldton	0	3	0
Chapleau	0	0	12
Sault Ste. Marie	0	11	0
Swastika	0	2	0
Sudbury	25	16	0
Parry Sound	26	14	0
Kemptville	71	16	0
Lake Erie	3	0	0

Eastern Tent Caterpillar, *Malacosoma americanum* (F.)—This defoliator of cherry and apple trees especially along roadsides showed a gradual increase in numbers for the second consecutive year. The increased numbers of early larval tents shown in the table indicate an upward trend in population levels in all districts except Sault Ste. Marie and Lake Erie. Highest counts were made in Harvey Township in the Lindsay District and the largest continuous areas of heavy infestation were in the Parry Sound District.

District	Number of tents per mile of roadside					
	No. of locations		Average count		Highest count	
	1959	1960	1959	1960	1959	1960
Sault Ste. Marie	1	10	1	1	1	1
Sudbury	2	3	1	4	1	6
North Bay	3	3	2	4	2	7
Pembroke	9	8	6	11	14	22
Parry Sound	4	6	14	30	22	79
Lake Simcoe	4	4	7	16	12	29
Lake Huron	10	10	21	28	63	86
Lake Erie	5	6	3	2*	5	4
Lindsay	12	7	14	35	84	137
Tweed	11	10	5	16	10	87
Kemptville	6	5	2	4	5	12

*Count of 116 colonies per mile in Bosanquet Twp. was excluded.

Western Tent Caterpillar, *Malacosoma pluviale* (Dyar)—There has been little change in the persistently low population levels of this insect in northern Ontario. Minor increases were evident in the number of tents present on pin cherry trees per mile of roadside in the Central Region compared with 1959 as shown in the following table:

District	Number of tents per mile of roadside					
	No. of locations		Average count		Highest count	
	1959	1960	1959	1960	1959	1960
White River	7	4	1	7	2	19
Chapleau	5	5	2	4	7	8
Gogama	5	5	2	4	5	8
Sault Ste. Marie	—	3	—	24	—	41
Sudbury	5	5	1	1	2	5

Fall Webworm, *Hyphantria cunea* (Drury)—The number of webs counted along a measured mile of roadside at numerous designated locations in northern Ontario in 1960 was low and in most instances fewer than in 1959. Moderate to severe defoliation of broad-leaved trees was reported on two islands in Rainy Lake in western Ontario; in Ross, Wilberforce, and South Algona townships in Renfrew County; at eight points in Peterborough, Northumberland, Hastings, and Prince Edward counties in southern Ontario; and at three locations in the Lake Erie District. Ash, elm, black cherry, and walnut trees, in the order given, were the host species most heavily infested.

Jack-pine Budworm, *Choristoneura pinus* Free.—Heavy infestations of this insect persisted for the second consecutive year in the Fort Frances District. The largest, covering approximately 50 square miles, occurred between Lowe and

Jessups lakes in the north-central part of the district. Small infestations persisted at Parker Lake, in the northeastern part of Farrington Township, east of Atikokan, and from Jean Lake east to Draper and Oreana lakes. Pockets of light-medium infestation were observed north and west of French Lake.

The only other infestation reported was in a Scots pine plantation in Gosfield Township, east of Windsor, where light defoliation has occurred for the past several years.

Black-headed Budworm, *Acleris variana* (Fern.)—Increases in the population level of this insect occurred in all regions for the second consecutive year. Although spruce and balsam fir were the principal hosts, small numbers of larvae were also found on hemlock trees in the Sault Ste. Marie District. The number of collections per district in the following table is indicative of population increases since 1958.

District	Number of collections		
	1958	1959	1960
Sioux Lookout	1	1	9
Kenora	1	0	20
Fort Frances	1	0	5
Port Arthur	2	2	7
Geraldton	1	2	17
Kapuskasing	1	1	8
Cochrane	1	1	11
White River	3	5	4
Chapleau	2	22	58
Gogama	4	16	26
Swastika	2	8	8
Sault Ste. Marie	3	13	31
Sudbury	5	14	18
North Bay	5	5	3
Parry Sound	4	14	14
Pembroke	5	8	11
Lake Huron	0	0	4
Lake Simcoe	2	1	3
Lindsay	2	0	8
Tweed	0	4	6
Kemptville	2	0	2
Lake Erie	0	0	1
	47	117	274

A Pine Tip Moth, *Rhyacionia adana* Heinr.—This newly recognized pest of young Scots and red pine plantations in Ontario caused severe damage in parts of the Lake Simcoe, Lake Huron, Parry Sound, and Sault Ste. Marie districts. Light infestations were reported in the Southeastern Region. The insect is now known to occur on young jack pine trees up to 3 feet in height throughout most of northern Ontario. A similar type of brown flagging that was prevalent on taller jack pines throughout the north was caused by *Rhyacionia frustrana* Comst. and an undetermined third species of *Rhyacionia.*

A Tip Moth, *Rhyacionia* sp.—Larvae of this undetermined species were received from districts throughout northern Ontario as far north as Sioux Lookout and Pitt Township, Cochrane District. This insect causes damage by boring into the current shoots of jack pine.

Spruce Bud Moth, *Zeiraphera ratzeburgiana* Ratz.—Severe damage was caused to the new shoots of large open-grown white spruce trees in the districts of Port Arthur, Sault Ste. Marie, Sudbury, Parry Sound, and Lindsay. Old infestations intensified and new ones developed, particularly in the Sault Ste. Marie and Sudbury districts.

A Tortricid on Oak, *Argyrotoxa semipurpurana* Kft.—Heavy infestations of this insect recurred in the Sault Ste. Marie and Lake Simcoe districts. Red oak stands were severely defoliated in Prince, Parke, Korah, and Tarentorus townships west of Sault Ste. Marie, and in Tosorontio, Mulmur, and Vespra townships in the Lake Simcoe District. The heavy infestation previously reported in Durham County, Lindsay District, subsided in 1960.

Orange-striped Oakworm, *Anisota senatoria* (J. E. Smith)—Infestations reported in the Lake Huron and Lake Erie districts in 1959 declined to light intensity in 1960. Severe defoliation of oak trees occurred along the Trent Canal near Campbellford, Lindsay District, and in Thurlow, Tyendinaga, and Ameliasburgh townships, Tweed District. Light defoliation was observed at numerous locations elsewhere in the southeastern part of the Province.

Fall Cankerworm, *Alsophila pometaria* (Harr.)—Population levels of this insect increased in southern Ontario. Elm trees along roadsides and on the fringes of woodlots in the southern half of the Lake Simcoe District were severely defoliated. A heavy infestation persisted in a 20-acre woodlot in West Flamborough Township, Lake Huron District. Many species of deciduous trees were severely defoliated at numerous locations on the Niagara Peninsula. Light to medium infestations were observed in the western part of Lincoln County, and in the London and Kingsville areas of the Lake Erie District. Other noteworthy infestations in Ontario occurred in Clark and Douro townships of the Lindsay District.

Spring Cankerworm, *Paleacrita vernata* (Peck)—Severe defoliation of white elm trees in a 30-acre woodlot in Elma Township, Perth County, and of open-grown elms at several locations in Grey and Bruce counties represented marked increases in abundance in the Lake Huron District. This looper also occurred in large numbers in heavy infestations of other geometrids on elms in the Lake Simcoe District. Spring cankerworms have for the past five years caused moderate defoliation of small numbers of elm trees along Highway 17 north of Renfrew in the Tweed District.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlk.)—The current outbreak of this insect reached its peak in Ontario in 1957, declined considerably in 1958 and 1959, and subsided in most areas in 1960. Heavy infestations persisted in two small areas northwest of Webbwood in the Sudbury District where severe defoliation of poplar occurred over a large area in 1959. Three small pockets of heavy infestation occurred in the southern part of the Gogama District. Moderate defoliation was observed in the south-central part of Manitoulin Island, and pockets of light to medium infestation occurred on the Bruce Peninsula.

A Noctuid, *Enargia decolor* Wlk.—The outbreak of this defoliator on trembling aspen in the Western Region in 1959 was of short duration. In 1960, severe infestation was restricted to small understory trees in Potts Township, Fort Frances District, and south of Red Lake, Sioux Lookout District. Small heavy infestations were reported on understory and pole-size aspen in parts of the Sault Ste. Marie and Sudbury districts.

Walnut Caterpillar, *Datana integerrima* G. and R.—Population levels of this insect declined for the third consecutive year in southern Ontario. Light

infestations were observed on scattered walnut trees in the Lake Simcoe District. Heavy infestations occurred in fewer areas in the Lake Huron and Lake Erie districts than in 1959.

Larch Casebearer, *Coleophora laricella* (Hbn.)—This introduced pest of tamarack occurs from the Sault Ste. Marie, Sudbury, and North Bay districts southward. Surveys in past years revealed its presence in parts of the White River and Geraldton districts and throughout most of the Port Arthur District, but not in the Western Region. The following summary shows little change between 1959 and 1960 in the average number of larvae per 18-inch branch tip in 12 districts.

District	Number of sample points	Average number of larvae per 18-inch branch tip	
		1959	1960
Port Arthur	5	9.1	2.6
Sault Ste. Marie	6	1.2	0.5
Sudbury	5	2.3	0.5
North Bay	7	0.8	0.7
Parry Sound	10	4.7	1.8
Pembroke	2	1.1	0.8
Lake Simcoe	5	3.3	6.1
Lake Huron	6	8.2	8.1
Lake Erie	6	6.8	3.5
Lindsay	9	1.3	0.9
Kemptville	5	1.2	1.8
Tweed	10	0.5	0.5

Aspen Blotch Miner, *Lithocolletis salicifoliella* Chamb.—Little change has been noted in the prevalence of this insect in northern Ontario during the past several years. Severe mining of trembling aspen foliage has been restricted to small open-grown or understory trees in localized areas. For example, in one stand in Dempsay Township, Cochrane District, 69 per cent of the foliage from trees ranging in height from 1 to 3 feet was mined but only 2 per cent of the foliage from trees 15 feet or more high was affected. In 1960 pockets of severe browning were reported in the Fort Frances, Port Arthur, White River, Chapleau, and Cochrane districts.

A Birch Leaf Miner, *Nepticula* sp.—The known distribution of this leaf miner was extended from the Georgian Bay area eastward into Haliburton and Victoria counties of the Lindsay District and southward throughout the Lake Simcoe District and a single collection was received from near McIntosh in the Kenora District. Heavy infestations persisted on white birch in the northern part of the Lake Huron District, where the insect was originally found. On the tip of of the Bruce Peninsula population levels dropped sharply because of competition with the birch skeletonizer, *Bucculatrix canadensisella* Cham.

Birch Skeletonizer, *Bucculatrix canadensisella* Cham.—Infestations of this insect were more widespread than in 1959. As a result, browning and premature shedding of the foliage of white birch trees occurred over extensive areas. The largest area affected was in southern Ontario, extending from the Lake Huron District eastward through most of the Lake Simcoe and Lindsay districts, thence through the central and northern sections of the Tweed District and the southern part of the Pembroke District. A heavy infestation recurred in Norfolk County and adjacent townships of the Lake Erie District.

The heavy infestation reported along the north shore of Lake Huron from Blind River to Thessalon in 1959 extended eastward to Cutler and westward to Desbarats.

Severe skeletonizing of white birch foliage also occurred throughout Manitoulin Island.

Birch Leaf Miner, *Fenusa pusilla* (Lep.)—Medium or heavy localized infestations of this sawfly on white birch were reported in eight districts in central and southern Ontario.

A Leaf Miner On Birch, *Profenusa thomsoni* (Konow)—This insect is known to occur in southern Ontario and as far north as the White River, Kapuskasing, and Cochrane districts. It was present in low numbers south of Lake Nipissing, but to the north it caused browning of white birch foliage in nine districts. Open-grown trees in residential areas were particularly susceptible.

Its complete absence in collections from the Geraldton District and west to the Manitoba border, suggests that this sawfly was accidentally introduced from Eurasia.

European Pine Sawfly, *Neodiprion sertifer* (Geoff.)—The major change in the distribution of this insect was again in the Lake Simcoe District, where a substantial eastward spread was reported. The insect is now established in the Lake Huron and Lake Erie districts except for the northern half of the Bruce Peninsula and the eastern half of the Niagara Peninsula. It is also established in the Lake Simcoe District west of a line from the mouth of the Nottawasaga River at Wasaga Beach, south to the west boundary of Camp Borden, through King and Vaughan townships to Leaside.

A control program by the Department of Lands and Forests and other plantation owners using chemical and virus insecticides has greatly reduced numbers of this sawfly in many plantations. However, heavy infestations were reported in the Goderich–Wingham and Owen Sound–Hepworth, areas, and scattered pockets of heavy infestation were observed for the first time in Dufferin and Peel counties in the Lake Simcoe District.

A survey of the introduced cocoon parasites of this sawfly was made at nine locations in southern Ontario. Two species were commonly recovered, *Dahlbominus fuscipennis* (Zett.) and *Aptesis basizona* (Grav.). The former species has been taken throughout the known range of *N. sertifer* and is quite abundant in the Lake Simcoe District. *A. basizona* was commonly recovered in the eastern half of the Lake Erie District, throughout the Lake Huron District, and was especially numerous in Adjala and Caledon townships at the leading edge of the host's advance in the Lake Simcoe District.

Introduced Pine Sawfly, *Diprion similis* (Htg.)—The westward spread of this introduced insect and its increasing numbers in the Lake Simcoe District make it worthy of attention. A seven-fold increase in larval numbers from 1959 was noted on a Scots pine shelterbelt in Mono Township and about two-fold increases were noted in Scarborough, Markham, and Pickering townships.

Lake Simcoe District townships	Average number of larvae per mat sample	
	1959	1960
Mono	8	62
Scarborough	6	9
Markham	3	11
Pickering	4	8

Discoveries of the insect on pines along the Queen Elizabeth Way south of St. Catharines on the Niagara Peninsula and near Port Burwell by officers of the Plant Protection Division have considerably extended the known distribution of this insect.

Red-headed Pine Sawfly, *Neodiprion lecontei* (Fitch)—Heavy infestations of this serious pest of pines continued to decline due to a public awareness of its damage and the application of control measures when necessary. One new heavy infestation was reported on an island in Lake Matinenda and heavy infestations persisted in Herrick Township of the Sault Ste. Marie District. Six plantations of red and jack pine were heavily infested in Manvers, Cramahe, and Fenlon townships in the Lindsay District. Moderate infestations were reported in seven townships located as follows: VanKoughnet, Sault Ste. Marie District; Wilson, Parry Sound District; Albion and Adjala, Lake Simcoe District; Sydenham, Lake Huron District; Olden and Darling, Tweed District. Elsewhere only occasional colonies were found.

Mountain-ash Sawfly, *Pristiphora geniculata* (Htg.)—The most notable feature of this introduced insect in 1960 was the further northward extension of its known range in both the Northern and Central regions. For example, a collection from Wawa was the first record from the White River District. The accompanying map compares the known distribution in 1952 with that of 1960.

Although population levels are known to fluctuate, no appreciable changes were observed in 1960. Pockets of severe defoliation occurred in the central part of the Sault Ste. Marie District, the southwestern part of the Sudbury District, and at other points in the districts of Lake Simcoe, Lake Huron, Lake Erie, Lindsay, and Tweed.

Red-headed Jack-pine Sawfly, *Neodiprion virginianus* complex—In most of northern Ontario population levels of this sawfly increased. Decreases were noted only in the districts of Sault Ste. Marie, North Bay, and Parry Sound. One or more areas of heavy infestation on jack pine were reported in each of the following districts: Fort Frances, Kenora, Port Arthur, Kapuskasing, Cochrane, Chapleau, Sudbury, and Lake Simcoe. Infestations of medium intensity occurred in many other parts of northern Ontario.

Swaine Jack-pine Sawfly, *Neodiprion swainei* Midd.—With the exception of the Fort Frances District, population levels of this sawfly declined markedly in 1960. Moderate defoliation persisted along the south shore of Sabaskong Bay on Lake of the Woods. Elsewhere, larvae were scarce in jack pine stands infested in 1959. The only heavy infestations reported in 1960 were on islands in Rabbit Lake, North Bay District; in Onaping Lake, Sudbury District; and in Banks Lake, Swastika District. Severe defoliation for the past several years at Rabbit Lake has caused considerable tree mortality.

Black-headed Jack-pine Sawfly, *Neodiprion pratti banksianae* Roh.—There was little change in the status of this insect. In the Fort Frances District, population levels increased at Mack Lake and Wild Land Reserve, and severe infestations recurred along Canoe Channel on Rainy Lake. The insect was reported for the first time in four years in the following townships of the Cochrane District: Calvert, Ogden, Dundonald, Clergue, and Murphy. Light infestations were reported from Hanmer, Nairn, and Rathbun townships and Cloche Island in the Sudbury District. In the South-central Region, decreases were reported on islands in the west arm of Lake Nipissing, North Bay District, and in Ryerson and Draper townships, Parry Sound District, but heavy infestation persisted in Monck and Humphry townships in the latter district. A general increase occurred in the Lake Simcoe District with high population levels in four townships: Oro, Medonte, Rama, and Orillia. A heavy infestation was reported from Kaladar Township in the Tweed District.

Red-pine Sawfly, *Neodiprion nanulus nanulus* Schedl—For the fourth consecutive year population levels of this insect have remained low. However, small increases were noted on Cloche Island, Sudbury District, and in Horton Township, Tweed District. Eight collections from the Cochrane District were the first received since 1954. Population levels declined in the Fort Frances, White River, and Chapleau districts.

Balsam-fir Sawfly, *Neodiprion abietis* complex—The downward trend in population levels begun in 1955 continued, although pockets of severe defoliation were found in the Batchawana Bay area of the Sault Ste. Marie District; in the townships of Parr and Kirkland in the Cochrane District; and in the townships of Dungannon and Bangor in the Tweed District. Elsewhere in Ontario, population levels declined or showed no change from the low levels of 1959. Noticeable decreases were recorded in the Pembroke and Lake Huron districts.

Balsam Bud-mining Sawfly, *Pleroneura borealis* Felt—The largest number of heavy infestations were from central Ontario including the districts of Sudbury, North Bay, Parry Sound, Pembroke, and Lindsay. Small areas of heavy infestation were reported from the districts of Swastika, Sault Ste. Marie, Chapleau, and Tweed and light damage occurred elsewhere. The infestation intensities were not as high as in 1958 but did continue the rather consistent pattern of fluctuating population levels that has been apparent since 1956, as follows:

Location	Percentage of new shoots damaged by years*				
	1956	1957	1958	1959	1960
Parry Sound District					
McKenzie Twp	11	0	8	0	4
Chaffey Twp	2	0	11	3	7
Pembroke District					
Alice Twp	15	0	13	1	4
Westmeath Twp	18	0	17	1	2

*Percentages are based on the examination of six 18-inch branches at each location.

A Leaf-folding Sawfly, *Nematus* sp.—Infestations of this undetermined sawfly on poplars in Ontario have been followed since 1956, when high population levels became prevalent. The first major change in the outbreak occurred in 1960. The number of leaf-folds on trembling aspen dropped sharply throughout northern Ontario and declined somewhat in southern Ontario as shown in the following table:

District	Average number of folds per 100-leaf sample		District	Average number of folds per 100-leaf sample	
	1959	1960		1959	1960
Sioux Lookout	9	5	Chapleau	5	2
Fort Frances	4	0	Gogama	13	12
Port Arthur	26	6	North Bay	6	4
Geraldton	14	8	Pembroke	84	39
Kapuskasing	16	5	Parry Sound	41	39
Cochrane	17	1	Lake Erie	46	34
Swastika	19	1	Lindsay	68	24
Sault Ste. Marie	11	1	Tweed	63	50
Sudbury	18	3	Kemptville	12	18
White River	1	3			

Yellow-headed Spruce Sawfly, *Pikonema alaskensis* (Roh.)—Small pockets of defoliation occurred in most forest districts on open-grown white spruce and black spruce growing under a wide range of conditions. Roadside trees, trees transplanted as ornamentals or windbreaks, and young spruce plantations were most commonly affected.

White-pine Shoot Borer, *Eucosma gloriola* Heinr.—In northwestern Ontario infestations of this shoot borer were restricted to young stands of jack pine at five separate locations in the Kenora and Fort Frances districts. In central and southern Ontario, all species of pine were affected. Moderate to heavy infestations on pines were reported as follows: red and Mugho pines in the Kirkwood Management Unit, Sault Ste. Marie District; jack pine in areas of the Sudbury District; Scots, jack, and red pines in the Parry Sound District; white pine in the Lindsay and Lake Huron districts; and young Scots pine in the Lake Erie District.

Maple Leaf Cutter, *Paraclemensia acerifoliella* (Fitch)—Heavy infestations caused severe thinning, browning, and premature drop of sugar maple foliage in numerous stands in southeastern Ontario. The greatest concentrations of the insect were centred in the districts of Tweed and Kemptville, particularly in the counties of Hastings, Frontenac, Leeds, Lanark, and Renfrew.

Northern Pine Weevil, *Pissodes approximatus* Hopk.—This weevil continued to be a problem of increasing importance in the management of Christmas tree plantations following cutting. Large numbers of weevils were noted at many points in the Parry Sound and Lindsay districts and in the Southwestern Region. Damage was most severe where there was inadequate control of weevils in stumps following harvesting over a period of years. In many instances the pales weevil, *Hylobius pales* (Hbst.) was also involved.

P. approximatus, long considered to be a secondary pest of pines weakened by primary factors, contributed to the death of Scots pine trees infested with *Hylobius radicis* Buch. in the Lake Simcoe District. The former species was also a serious problem in Scots pine plantations in the Huntsville, Novar, Melissa, and Sprucedale areas of the Parry Sound District, where trees had been seriously weakened by winter injury. In the Kirkwood Management Unit of the Sault Ste. Marie District, a large proportion of the young red pine trees weakened or killed by unknown causes offered ideal sites for this weevil. In the Searchmont area, diseased red pine trees proved to be suitable hosts. Stem attack was found as far north as Sheraton Township in the Cochrane District.

Samples from Colorado blue spruce trees originally imported from Holland as seedlings in 1950 were submitted to the Laboratory by Plant Protection Division officers in 1960. These proved to be the first Survey records of *P. approximatus* not breeding in pine stock.

White-pine Weevil, *Pissodes strobi* (Peck)—No appreciable change was detected in the prevalence of this serious pest of open-grown pines and spruces. In the northernmost part of Ontario black spruce, white spruce, and jack pine were the most common host trees. The incidence of weevilling of open-grown white spruce ranged from a trace to 30 per cent in an old field stand in the Cochrane District and up to 17 per cent in young jack pine stands over a sizeable area in Township 11B, Chapleau District. Farther south, infestations were common in plantations of white pine, Scots pine, jack pine, and Norway spruce between 4 and 15 feet in height. In many cases the insect was controlled by the use of insecticides or by pruning and destroying infested leaders.

An Ambrosia Beetle, *Corthylus punctatissimus* (Zimm.)—High population levels of this beetle occurred for the second consecutive year in parts of

southern Ontario and caused additional mortality of hard maple regeneration. Heavy infestations persisted in the northern and eastern two-thirds of the Lake Huron District, throughout the Lake Simcoe District, and in a woodlot in Oneida Township, Lake Erie District. In contrast, populations declined to a low level in the southern part of the Parry Sound District.

Oak Twig Pruner, *Elaphidion parallelum* Newn.—The heavy infestations of 1959 in the Lake Simcoe, Parry Sound, and Lindsay districts subsided and only light infestations were reported in Murray Township, Lindsay District, and in Ridout Township, Parry Sound District. Heavy infestations were recorded in the Cayuga-Dunnville area, Lake Erie District. A light infestation was noted in Kaladar Township, Tweed District.

European Elm Leaf Beetle, *Galerucella xanthomelaena* (Schr.)—Light to heavy infestations of this introduced pest were prevalent on elms south of the Niagara Escarpment and records of its occurrence along the north shore of Lake Ontario extended its range eastward into the Tweed District.

Elm Flea Beetle, *Altica ulmi* Woods—This insect was more abundant in southern Ontario in 1960 than in recent years. Elm trees suffered moderate to severe defoliation at numerous locations in the southern part of the Lake Simcoe District, and in Haliburton, Victoria, and Northumberland counties in the Lindsay District. Pockets of heavy infestation occurred in Osnabruck and Thurlow townships in the Kemptville and Tweed districts. Light to medium defoliation was observed at widely separated locations in the Lake Huron and Lake Erie districts.

Pine Spittle Bug, *Aphrophora parallela* (Say)—All species of pine are subject to attack by this insect, but dense Scots pine plantations 20 to 30 feet in height are most susceptible to heavy attack. Plantations of this type were severely attacked in the Medina, Lakeside, and Williamsford forest tracts, Lake Huron District, and in the Durham County Forest and Darlington Township, Lindsay District. The Vivian Forest infestation, Lake Simcoe District, declined to very light intensity.

White pine trees were heavily infested in Laird Township east of Sault Ste. Marie and in Bishop Township, Pembroke District. In the latter district, an unusually large number of spittle masses were present on jack pine trees in Edgar, Westmeath, and Richards townships.

Midge Damage to Red Pine—Larvae of an unknown species of midge attacked the needle fascicles of red pine causing drooping and shedding of affected foliage. About 75 per cent defoliation of 5- to 15-foot trees was noted in a roadside planting in Thompson Township, Sault Ste. Marie District.

Spruce Bud Gall Midge, *Rhabdophaga swainei* Felt—This insect infested small open-grown white spruce and black spruce trees in northern Ontario. The numbers of dead terminal buds on spruce regeneration at one location in Township 20, Range 23, White River District, averaged 20 per tree. A similar type of bud mortality on spruces and balsam fir caused by *Argyresthia* spp. is also known in northern Ontario.

Insect Species	Number of collections by forest regions and districts*																				
	Western			Mid-western		Northern			Central					South-central			South-western			South-eastern		
	Sioux Lookout	Kenora	Fort Frances	Geraldton	Port Arthur	Kapuskasing	Cochrane	Swastika	White River	Sault Ste. Marie	Chapleau	Gogama	Sudbury	North Bay	Parry Sound	Pembroke	Lake Simcoe	Lake Huron	Lake Erie	Lindsay	Tweed	Kemptville
Acleris variana	9	20	5	17	7	8	11	8	38	31	58	26	18	3	14	11	3	4	1	3	6	
Alsophila pometaria		0	1														3	8	11	4	3	0
Altica ulmi																	16	7	7	6	3	2
Anisota senatoria																		3	1	1	11	
Aphrophora parallela	0	1	5	1	0	2	5	4	7	8	3	6	0	11	7	9	1	5	0	1	0	
Argyrotoxa semipurpurana										3							1			0		
Bucculatrix canadensisella	0	0		0	0	0	0		0	9	0	0	6		1	7	27	25	1	9	13	3
Choristoneura conflictana	0	0	0	1	3	0	0	1	1	1	1	1	6	1	0		1	0		1		
Choristoneura fumiferana	6	26	38	37	35	12	5	1	8	5	19	2	15	1	0	0	7	4	1	1	1	1
Choristoneura pinus	0	3	7		1		5	1	1	1	0		2	2	0	1	0	1	0	1		
Coleophora laricella				1	10		1			1			5	6	9	3	5	7	5	2	4	4
Corthylus punctatissimus															2		2	3	1			
Datana integerrima																	1	10	5	0	0	0
Diprion similis																	8	8	2			

Elaphidion parallelum													1		0		0		3	1	3	0
Enargia decolor	6	12	25	4	2	4	2	2	11	12	16	24	12	4	2	1	0					
Eucosma gloriola	1	5	1							0			4		7		9	2	3	1	0	1
Fenusa pusilla										2			6	11	5	20	1	1	2	7	1	3
Galerucella xanthomelaena																		0	7	0	1	
Hyphantria cunea		2	10				1		1	7		1	2	8	9	14	11	44	13	10	9	17
Lithocolletis salicifoliella		4	19	11	11	6	20	1	7	3	18	6	6	10		4			0	0		
Malacosoma americanum										1			12	4	23	9	11	20	10	10	12	8
Malacosoma disstria	6	21	9	1	2	0	0	0	0	0	0	0	20	2	4	0	0	3	1	0	4	1
Malacosoma pluviale	3	2	0	6	3	1	8	7	5	10	16	9	6	2								
Nematus sp.	2	1	6	9	1	6	10	1	4	3	6	4	7	2	9	25		0	0	1	8	4
Neodiprion abietis complex	4	1	5	0	0	4	6	1	10	10	5	2	6	0	1	3	0	2	1	6	5	2
Neodiprion lecontei										7			3	3	5		20	4		18	3	6
Neodiprion nanulus nanulus	7	10	5	1	9	0	8	3	11	1	7	3	4	1	4	7	0	0		1	3	1
Neodiprion pratti banksianae	3	4	8	0	0	1	6		1	1	6	1	11	5	15	10	4	4		1	5	4
Neodiprion sertifer																	19	16	22			
Neodiprion swainei	1	0	3					5		4	9	10	16	0	0			6				
Neodiprion virginianus	8	12	22	11	34	10	20	9	23	3	19	32	11	6	5		4	0			0	1
Nepticula sp.		1	-										0		1		30	31		2		
Paleacrita vernata																	2	7	0	1	1	0
Paraclemensia acerifoliella																1	0	2		0	8	10
Pikonema alaskensis	11	17	19	15	20	12	20	18	24	25	30	22	25	19	15	14	9	19		2	12	18

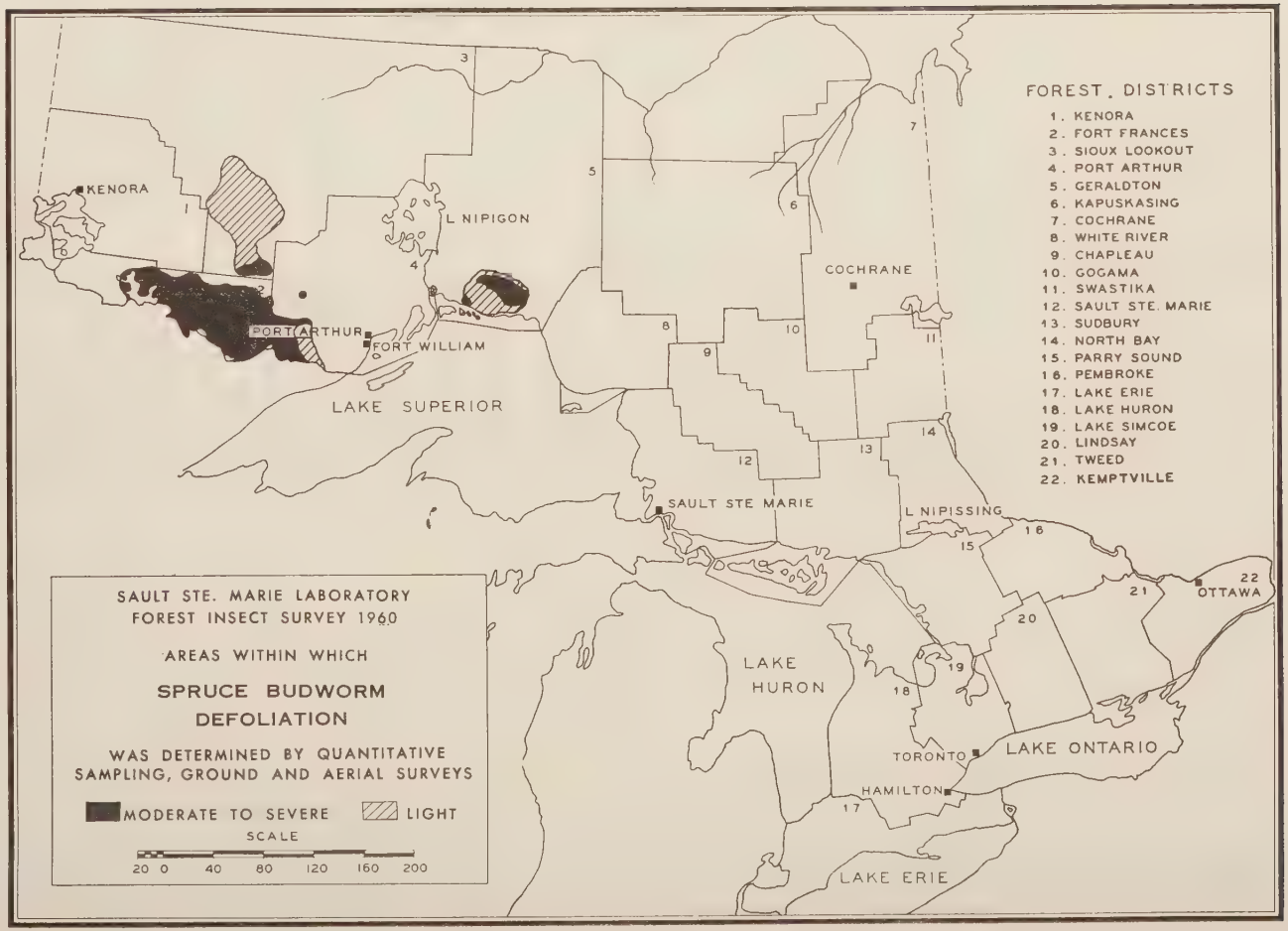
SUMMARY OF INSECT COLLECTIONS—Concluded

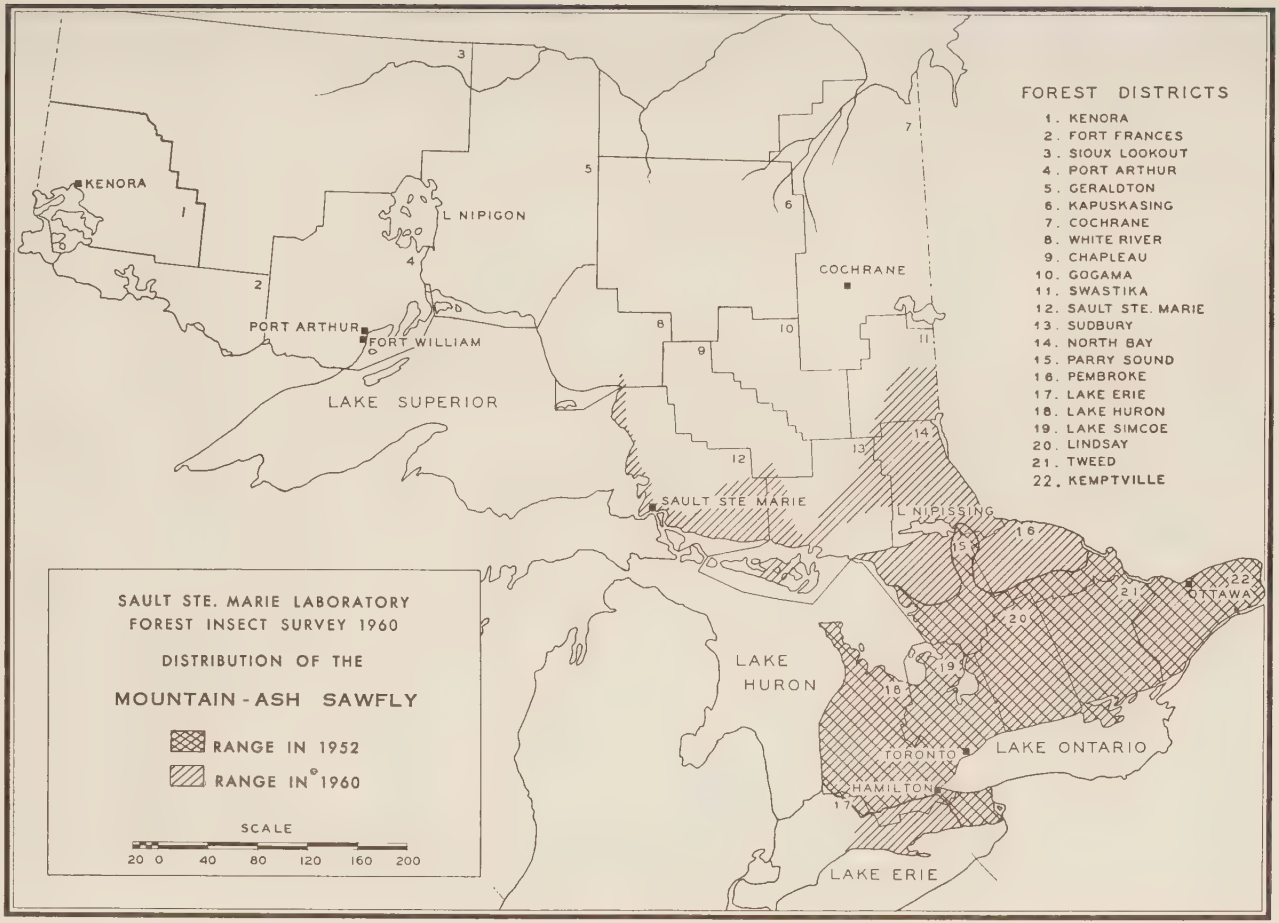
Insect Species	Number of collections by forest regions and districts*																					
	Western			Mid-western		Northern			Central					South-central			South-western			South-eastern		
	Sioux Lookout	Kenora	Fort Frances	Geraldton	Port Arthur	Kapuskasing	Cochrane	Swastika	White River	Sault Ste. Marie	Chapleau	Gogama	Sudbury	North Bay	Parry Sound	Pembroke	Lake Simcoe	Lake Huron	Lake Erie	Lindsay	Tweed	Kemptville
Pissodes approximatus		1	0		0		1			2	1		0	0	3	1	1	1	1	2	0	1
Pissodes strobi	0	0	2	13	6	5	13	0	12	11	4	7	6	8	5	8	12	5	4	16	2	5
Pleroneura borealis	1	8	9	9	2	3	18	8	1	8	15	0	16	11	13	5	0	2		7	3	2
Pristiphora erichsonii	1	10	21	15	29	12	17	15	24	16	33	6	19	16	20	25	20	15	5	25	21	14
Pristiphora geniculata								9	1	10	1		11	6	8	4	1	9	1	6	1	0
Profenusa thomsoni		1				5	14	10	6	15	28	9	25	5	4	5		2	0	0	1	0
Rhabdaphaga swainei	14	22	4	26	28	13	20	9	9	5	5	3	9	1	4	1	5	1			1	2
Rhyacionia sp.	4	5	1		3	1	6	3	1													
Rhyacionia adana		4				1	3	2		1	0		19	2	3	0	8	4		5	2	1
Rhyacionia buoliana										2					0		1	0	2	4	1	0
Zeiraphera ratzeburgiana		0	1	1	8			0	0	4	1	0	2	1	2			1		0	1	

* A zero entry denotes nil collections in 1960; a blank indicates no records in recent years.

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Anisota rubicunda (Fabr.)...	Maple, red	Central Ontario	Low population levels.
Archips cerasivoranus (Fitch)	Cherry, willow, etc.	Most districts	Heavy infestations.
Arge pectoralis (Leach).....	Birch, white	Monteagle Twp., Tweed District	Small area of severe defoliation.
Baliosus ruber (Web.).....	Basswood	Smith Twp., Lindsay District	Severe infestations.
Cecidomyia reeksi Vock.....	Pine, jack	Durham County	Severe twig mortality, in two plantations.
Coleophora ulmifoliella McD.	Elm, white	Verulam Twp., Lindsay District	Heavy infestation on shade trees.
Corythucha arcuata Say.....	Oak, bur, and white; birch, elm	Tweed and Lindsay districts	Patches of heavy infestation caused browning of foliage.
Dasyneura balsamicola (Lint.)	Fir, balsam	Cochrane, Sault Ste. Marie, and Sudbury districts	Marked increase in infestation intensities.
Dendroctonus simplex Lec...	Tamarack, European larch	Lake Erie District	Boles of living trees riddled at three locations.
Diprion hercyniae (Htg.)....	Spruce, white	South half of Ontario	No appreciable change.
Epinotia solandriana Linn...	Aspen, trembling	Sunnidale Twp., Lake Simcoe District Herschel Twp., Tweed District	Localized heavy infestations.
Erannis tiliaria (Harr.).....	Oak, red; elm, white	Manitoulin Island, Welland and Lincoln counties	Heavy infestations.
Exoteleia dodecella Linn.....	Pine, Scots	Kitley Twp., Kemptville District	70 per cent of bud clusters in a windbreak infested.
Exoteleia pinifoliella (Cham.)	Pine, jack	Sault Ste. Marie, Sudbury, Parry Sound, Lake Simcoe, Lake Erie, Lindsay, and Kemptville districts	One or more heavy infestations per district.
Fenusa ulmi Sund.....	Elm, white, and slippery	Grey and Hastings counties	Localized heavy infestations.
Galerucella decora (Say).....	Willow	Fort Frances, Kenora, and Sioux Lookout districts	Severe skeletonizing and browning widespread.
Heterarthrus nemoratus (Fall.)	Birch, white	South half of Sault Ste. Marie District and Bruce County	Pockets of heavy infestation.
Hylobius radicis Buch.....	Pines	Parry Sound, Pembroke, and Lake Simcoe districts	Locations of infested areas unchanged from 1959.
Lecanium corni Bouché.....	Maple, sugar	Lake Huron District	Several heavy infestations.
Leucanthiza dircella Braun..	Leatherwood	Lindsay District	Mined foliage on all trees observed.
Lithocolletis hamadryadella Clem.	Oak	Lindsay and Tweed districts	Spots of heavy infestation.
Ocnerostoma piniariella Zell..	Pine, red	Turkey Point Norfolk County	One compartment heavily infested.
Phalonia rutilana Hbn.....	Juniper, common	Kenora	Heavy infestations.
Phytagromyza populicola (Hal.)	Poplar, balsam	South half of Lindsay District	Severe mining of leaves.
Tortrix alleniana Fern.....	Pine, Scots.....	Central and northern parts of Lake Huron District	Heavy infestations in newly-established plantations.
Tortrix pallorana Rob.....	Pine, Scots	Central and northern parts of Lake Huron District	Heavy infestations in newly-established plantations.


FOREST DISTRICTS
1. KENORA
2. FORT FRANCES
3. SIOUX LOOKOUT
4. PORT ARTHUR
5. GERALDTON
6. KAPUSKASING
7. COCHRANE
8. WHITE RIVER
9. CHAPLEAU
10. GOGAMA
11. SWASTIKA
12. SAULT STE. MARIE
13. SUDBURY
14. NORTH BAY
15. PARRY SOUND
16. PEMBROKE
17. LAKE ERIE
18. LAKE HURON
19. LAKE SIMCOE
20. LINDSAY
21. TWEED
22. KEMPTVILLE
KENORA
L NIPIGON
PORT ARTHUR
FORT WILLIAM
LAKE SUPERIOR
COCHRANE
SAULT STE MARIE
L NIPISSING
OTTAWA
LAKE HURON
TORONTO
LAKE ONTARIO
HAMILTON
LAKE ERIE
SAULT STE. MARIE LABORATORY
FOREST INSECT SURVEY 1960
AREAS WITHIN WHICH
SPRUCE BUDWORM
DEFOLIATION
WAS DETERMINED BY QUANTITATIVE
SAMPLING, GROUND AND AERIAL SURVEYS
MODERATE TO SEVERE
LIGHT
SCALE
20 0 40 80 120 160 200


FOREST DISTRICTS
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LAKE SUPERIOR
COCHRANE
SAULT STE MARIE
L NIPISSING
OTTAWA
LAKE HURON
TORONTO
LAKE ONTARIO
HAMILTON
LAKE ERIE
SAULT STE. MARIE LABORATORY
FOREST INSECT SURVEY 1960
DISTRIBUTION OF THE
MOUNTAIN-ASH SAWFLY
RANGE IN 1952
RANGE IN 1960
SCALE
20 0 40 80 120 160 200

PROVINCE OF ONTARIO

FOREST DISEASE SURVEY

J. Reid and H. D. Griffin

Forest Biology Laboratory, Maple, Ontario

INTRODUCTION

The cool moist weather prevalent during the spring and early summer favored tree growth throughout the Province. These conditions, however, also favored the development of fungi, and numerous new records were obtained.

A total of 4,003 collections was received during the 1960 season, and they were distributed by tree species as follows:

Coniferous Trees	Collections	Broad-leaved Trees	Collections
Balsam fir	201	Maple	557
Jack pine	141	Elm	466
White pine	129	Poplar	450
Black spruce	87	Alder	392
White spruce	65	Birch	376
Red pine	39	Willow	215
Scots pine	24	Mountain ash	132
Tamarack	16	Oak	101
Cedar	12	Ash	87
Juniper	4	Basswood	64
Hemlock	3	Ironwood	37
Others	3	Hazel	36
		Amelanchier	24
Total	724	Beech	16
		Dogwood	16
		Elder	14
		Sumac	13
		Hawthorn	12
		Others	74
		Total	3,082

Miscellaneous hosts..... 197

Grand Total.....4,003

IMPORTANT DISEASES

Dutch Elm Disease—During 1960, *Ceratocystis ulmi* (Buism.) C. Moreau, the causal organism of Dutch elm disease, was isolated from 138 of 391 samples.

In 1960, the organism was found for the first time in Simcoe, Wellington, and Renfrew counties, and in the Parry Sound District.

Ink Spot Disease of Aspen Poplar—*Ciborinia whetzelii* (Seav.) Seav., the causal agent of this disease was again found generally distributed throughout Ontario. In contrast to 1959, however, there were few reports of small trees being killed. The pattern of infection on both small and large trees was early killing of severely infected leaves with these remaining on the trees until fall. This resulted in a scorched appearance of affected trees during the growing season.

Leaf and Twig Blight of Poplar—This condition was much more extensive in 1960 on trembling and largetooth aspen, as well as on balsam poplar, than during 1959. *Pollaccia radiosa* (Lib.) Bald. & Cif. was found on trembling and largetooth aspen collections from the Fort Frances, Sault Ste. Marie, Port Arthur, Geraldton, White River, Gogama, Swastika, Sudbury, Pembroke, and Lake Huron districts. *Pollaccia elegans* Serv. was found on collections of balsam poplar from the White River, Geraldton, Sioux Lookout, and Port Arthur districts.

Eutypella Canker of Maple—*Eutypella parasitica* Davidson & Lorenz is constantly associated with trunk canker of red and sugar maple in Ontario. The canker has been reported from the Lake Huron, Sault Ste. Marie, Lake Simcoe, Parry Sound, and Pembroke districts, with up to 40 per cent of the trees in some stands being affected. Trees less than 5 inches D.B.H. are often killed, while larger trees usually survive. The cankers persist on the larger trees for many years, but such trees often break under stress at the canker.

The cankers are characterized by firmly attached bark, with broad, slightly raised rings of callus. In the central portion are found the embedded perithecia of the causal organism. These are usually only visible as clusters of slightly erumpent, black ostioles.

Maple Dieback—No changes were recorded in the boundaries of the affected areas in 1960. It was apparent, however, that a new condition was affecting some hard maples in parts of the Province. This condition was characterized by rapid dying of individual branches, with a pronounced reddening of the foliage of the affected branch. No causal agent was found, although *Stegonosporium pyriforme* (Hoffm. ex Fr.) Cda. normally considered a saprophyte, was often found fruiting on recently killed branches. Furthermore, this organism was repeatedly isolated from branches in various stages of decline.

Needle Rusts of Conifers—Rusts, caused by *Chrysomyxa ledicola* Lagerh. and *Chrysomyxa ledi* de Bary, were general throughout the range of white and black spruce in northern Ontario.

Rust damage to balsam fir was generally light. Collections were received from the Fort Frances, Port Arthur, Sioux Lookout, Geraldton, White River, and Gogama districts.

Once again the incidence of *Coleosporium asterum* (Diet.) Syd. was high on jack and red pine in the Lake Simcoe, Lake Erie, Lake Huron, Fort Frances, Parry Sound, and Pembroke districts.

OTHER NOTEWORTHY DISEASES

Host	Organism	Locality	Remarks
Alder.....	*Cryptosporella paucispora* (Pk.) Berl. & Vogl.	Various townships in the Fort Frances, Kenora, Sioux Lookout, Kapuskasing, White River, Cochrane, Sudbury, and North Bay dists.	First Canadian records.
	Cyphella fasciculata (Schw.) Berk. & Curt.	Various townships in the Sioux Lookout, Kenora, Fort Frances, Port Arthur, Geraldton, Kapuskasing, and Sudbury dists.	First herbarium records.
	Tympanis alnea (Pers.) Fr.	Various townships in the Sioux Lookout, White River, Sudbury, Pembroke, and Lake Simcoe dists.	First herbarium records.
Alder, speckled....	*Pezicula alni* (Fckl.) Rehm	Bear Island, North Bay Dist.	First herbarium record.
	Taphrina robinsoniana Geis.	Chalk River, Pembroke Dist.	Caused hypertrophy of mature fertile catkins.

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Host	Organism	Locality	Remarks
Ash, white.....	*Hysterographium fraxini* (Pers.) deNot.	Stafford Twp., Pembroke Dist.	First herbarium record.
Balsam fir.....	*Godronia abietis* (Naumov.) Seav.	Hardwick Twp., Port Arthur Dist.	First herbarium record.
Beech, blue.....	*Melanconis chrysostroma* var. *carpinigera* (Berk.) Wehm.	New Durham, Lake Huron Dist.	First herbarium record.
	Rutstroemia bolaris (Batsch. ex Fr.) Rehm	Yarmouth Twp., Lake Erie Dist.	First herbarium record.
	Melanconis chrysostroma var. *ellisii* Wehm.	Yarmouth Twp., Lake Erie Dist.	First herbarium record.
Birch, white.....	*Melanconis stilbostoma* (Fr.) Tul.	Various townships in the Sioux Lookout, Kenora, Fort Frances, Port Arthur, and Sault Ste. Marie dists.	First herbarium records.
Birch, yellow.....	*Melanconis nigrospora* (Pk.) Wehm.	Ridout Twp., Parry Sound Dist. and Medonte Twp., Lake Simcoe Dist.	First herbarium records.
Cedar, white.....	*Pestalotia funerea* Desm.	Rolph Twp., Pembroke Dist.	First host record.
Cherry.....	*Calosphaeria minima* Tul.	Baird Twp., Sioux Lookout dist.	First herbarium record.
	Dermea pruinastri (Pers. ex Fr.) Fr.	Mattagami Twp., Sudbury Dist.	First herbarium record.
	Diaporthe pruinicola (Pk.) Wehm.	Laurier Twp., Parry Sound Dist.	First herbarium record.
	Diaporthe pruni Ell. & Ev.	New Durham, Lake Huron Dist., and St. Williams, Lake Erie Dist.	First herbarium records.
Cherry, choke.....	*Diaporthe pruinicola* (Pk.) Wehm.	Various townships in the Cochrane, Pembroke, Lindsay, and Lake Simcoe dists.	First herbarium records.
	Dermea pruinastri (Pers. ex Fr.) Fr.	Milner Lake, Swastika Dist., and Mond and Hazen Twps., Gogama Dist.	First Herbarium records.
Cherry, pin.....	*Calosphaeria princeps* Tul.	Baird Twp., Sioux Lookout Dist. and Grenfell Twp., Swastika Dist.	First herbarium records.
	Dermea padi (Alb. & Schw.) Fr.	Macklem Twp., Cochrane Dist.	First herbarium record.
Chestnut.....	*Cryptospora cinctula* (Cke. & Pk.) Sacc.	St. Williams, Lake Erie Dist.	First herbarium record.
Elder.....	*Puccinia bolleyana* Sacc.	Various townships in the Kapuskasing, White River, and Chapleau dists.	Caused galls on small branches, petioles, and leaves.
Elm, white.....	*Apioporthe apiospora* (Ell. & Ev.) Wehm.	Galheath Twp., Sault Ste. Marie Dist., Olden Twp., Tweed Dist., and Holland Marsh, Lake Simcoe Dist.	First herbarium
	Cryptosporella hypodermia (Fr.) Sacc.	Winnipeg, Manitoba.	First herbarium record.
Hawthorn.....	*Diaporthe eres* Nit.	Kinless and Osprey Twps., Lake Huron Dist.	First herbarium records.
Hazel.....	*Apioporthe anomala* (Pk.) Höhn.	Various townships in the Port Arthur, Sault Ste. Marie, Sudbury, and Pembroke dists.	First herbarium records.
Hickory, shagbark.	*Microstroma juglandis* (Bereng.) Sacc.	St. Williams, Lake Erie Dist.	First herbarium record.
Leatherleaf.....	*Chrysomyxa cassandrae* (P. & C.) Tranz.	Twp. 32, White River Dist.	First herbarium record.
	Gibbera pulchella (Cke. & Pk.) Petr.	Twp. 32, White River Dist. and Hornings Mills, Lake Simcoe Dist.	First herbarium records.
Maple, mountain..	*Diaporthe acerina* (Pk.) Sacc.	Various townships in the Port Arthur, Gogama, Sault Ste. Marie, Sudbury, and North Bay Dists.	First herbarium records.
	Hypoderma rufilabrum (B. & C.) Duby	Brutus Twp., Chapleau Dist. and Strong Twp., Parry Sound Dist.	First herbarium records.

Host	Organism	Locality	Remarks
	Rutstroemia setulata (Dearn. & House) White	Brutus Twp., Chapleau Dist.	First herbarium record
	Sphaeriopsis clintonii Pk.	Badgerow Twp., North Bay Dist.	First herbarium record.
Maple, red	*Melanconis everhartii* Ell.	Sherborne Twp., Parry Sound Dist. and Whitchurch Twp., Lake Simcoe Dist.	First herbarium records.
Maple, sugar	*Diaporthe dubia* Nit.	Various townships in the Pembroke, Parry Sound, Lake Simcoe, and Lake Huron dists.	First herbarium records.
	Melanconis everhartii Ell.	Chapman Twp., Parry Sound Dist.	First herbarium record.
	Cryptodiaporthe myinda (Cke. & Ell.) Wehm.	Ramsay-Wright Twp., White River Dist.	First herbarium record.
	Cryptodiaporthe myinda (Cke. & Ell.) Wehm.	Ramsay-Wright Twp., White River Dist.	First herbarium record.
Oak, red	*Cryptodiaporthe densissma* (Ell.) Wehm.	Various townships in the Sault Ste. Marie, Parry Sound, and Lake Simcoe dists.	First Ontario ecords Associated with the cankering and killing of small branches.
	Diaporthe taleola (Fr.) Sacc.	Docker Twp., Kenora Dist.	Second Canadian reportf this organism.
	Diplodia quercus Fckl.	Morrison Twp., Parry Sound Dist.	First herbarium record.
Oak, white	*Cryptodiaporthe densissima* (Ell.) Wehm.	Various townships in the Pembroke, Tweed, Lindsay, and Lake Simcoe dists.	First Ontario records.
	Diaporthe leiphaemia var. *ravenliana* (Thüm. & Rehm) Wehm.	Various townships in the Lake Simcoe Lake Huron, and Lake Erie dists	First herbarium records.
	Pseudovalsa longipes (Tul.) Sacc.	Various townships in the Kemptville, Lake Simcoe, and Lake Erie dists.	First herbarium records.
Pine, jack	*Biatorella resinae* (Fr.) Mudd.	Jullian Twp., White River Dist.; Mattagami Twp., Sudbury Dist.; and St. Williams, Lake Erie Dist.	Growing on resin exudate caused by insect attack.
	Lophium mytinellum (Pers.) Fr.	Evelyn Twp., Cochrane Dist.	First herbarium record.
	Propolis rhodoleuca Fr.	Raleigh Twp., Kenora Dist. and East Bull Lake, Sudbury Dist.	First herbarium records.
Pine, red	*Tympanis* sp.	Gaudette Twp., Sault Ste. Marie Dist.	First herbarium host record.
Pine, Scots	*Propolis rhodoleuca* Fr.	New Durham, Lake Huron Dist. and Everette, Lake Simcoe Dist.	First herbarium records.
Pine, white	*Caliciopsis pinea* (Pk.)	Various townships in the North Bay, Pembroke, and Lake Huron Dists.	Associated with superficial cankers on white pine.
	Septobasidium pinicola Snell	Keewatin Lake, Kenora Dist. and Sibley Park, Port Arthur Dist.	Major extension of known range for this fungus.
Ribes	*Puccinia caracis* var. *grossulariata* Arth.	Herschel Twp., Tweed Dist.	First herbarium record.
Serviceberry	*Diaporthe tuberculosa* (Ell.) Sacc.	Various townships in the Sudbury, Lake Simcoe, and Lake Huron dists.	First herbarium records.
Spruce, white	*Chrysomyxa priolata* (Wint.)	Various townships in the Kapuskasing and White River dists.	Cone rust.
Sumac	*Diaporthe spiculosa* (A. & S.) Nit.	Nashville and Snowball, Lake Simcoe Dist. and St. Williams, Lake Erie Dist.	First herbarium records.
Tulip tree	*Tricothecium roseum* Link.	Mersea Twp., Lake Erie Dist.	First herbarium record.
Willow	*Cryptodiaporthe salicina* (Curr.) Wehm.	Drayton Twp., Sioux Lookout Dist. and Rose Twp., Sault Ste. Marie Dist.	First herbarium records.
	Diaporthe tessella (Pers.) Rehm	Hilliard Twp., Swastika Dist. and Mannheim and Beverley Swamp, Lake Huron Dist.	First herbarium records.
	Valsella salicis Fckl.	Comp. 60, White River Dist.	First Canadian record.

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PROVINCES OF MANITOBA AND SASKATCHEWAN

FOREST INSECT SURVEY

R. M. Prentice and V. Hildahl

Forest Biology Laboratory, Winnipeg, Manitoba

INTRODUCTION

The 1960 season was notable for changes in the status of several important forest insects including the larch sawfly, balsam-fir sawfly, and the forest tent caterpillar. The spruce budworm decreased in severity in the Interlake region, but the infestation in the Namew Lake area along the Manitoba–Saskatchewan border continued and expanded.

The most striking changes were widespread extensions of the larch sawfly outbreak in the Prince Albert District of Saskatchewan and the Northern District of Manitoba following five to six years of negligible damage throughout these areas. Spectacular reddening of foliage by the balsam-fir sawfly in balsam fir stands throughout the Interlake and northern regions of Manitoba was the first Survey record of this insect causing extensive forest damage in the Manitoba–Saskatchewan region. The discovery of 18 widely distributed spot infestations of the forest tent caterpillar, mostly covering less than one township, may indicate the inception of a general outbreak period.

Aerial surveys were hampered in the Northern and Eastern districts of Manitoba owing to the serious forest fire situation during the first half of the field season. As a result, northern boundaries of larch sawfly and spruce budworm attack were mapped with somewhat less precision than in previous years.

The number of samples received at the Laboratory totalled 3,754 and were distributed among the principal host trees as follows:

Coniferous Trees	Collections
White spruce	487
Jack Pine	360
Tamarack	284
Black spruce	173
Balsam fir	143
Cedar	10
Scots pine	8
Colorado spruce	6
Lodgepole pine	3
Total	1,474

Broad-leaved Trees	Collections
Trembling aspen	1,074
Willow	342
Birch	184
Balsam poplar	143
Speckled alder	131
Eastern chokecherry	117
Manitoba maple	98
Bur oak	34
Alternate leaf dogwood	22
Green ash	15
White elm	11
Hazelnut	8
Pincherry	6
Caragana	3
Basswood	1
Total	2,189

Miscellaneous hosts..... 91

Grand Total.....3,754

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—Aerial surveys of the spruce budworm outbreak in the Namew Lake area of northern Manitoba and Saskatchewan indicated further northward and eastward extensions of infestation boundaries. White spruce and balsam fir suffered moderate to severe defoliation in an area of about 900 square miles—an increase of about 150 square miles over 1959. A sharp increase in tree mortality was recorded in permanent study plots in the old infestation area at Sturgeon Landing where white spruce and balsam fir have been under heavy attack for the past nine years. White spruce, the principal host in this area, now shows over 50 per cent mortality in the 1- to 3-inch D.B.H. class, and 25 per cent mortality of trees over 3 inches D.B.H. Between 40 and 60 per cent mortality was recorded for balsam fir in all diameter classes. Most of the living trees show extensive top killing and additional rapid deterioration of the stands can be expected if the outbreak continues.

Aerial surveys conducted in cooperation with the Saskatchewan Forestry Branch indicated no new infestations in the Pasquia Hills Provincial Forest and other areas adjacent to the Namew Lake infestation. The small isolated pockets of defoliation previously reported along the Birch River coalesced in 1960 and now cover approximately 16 square miles.

There was a further decline in budworm numbers in the old infestation in the Eastern District of Manitoba. Larvae were common at Beaver Creek, Washow Bay, and Hecla Island in the Interlake region, but defoliation in these areas was mainly attributed to the balsam-fir sawfly.

An increase in population levels of the spruce budworm was evident in the Riding Mountain National Park. Up to 40 per cent defoliation of current growth on white spruce was recorded over an area of approximately 50 square miles at the north end of Clear Lake. A somewhat smaller area of about 10 square miles on the eastern escarpment of the Park suffered 60 to 70 per cent defoliation of current growth of mature balsam fir trees.

In the southern part of the two provinces larval sampling showed no appreciable changes. The small infestation in the West Block of the Cypress Hills Provincial Forest continued and severe defoliation of white spruce trees was limited to about 100 acres. A number of forked tops have resulted but no tree mortality has yet occurred. Examination of increment cores from overmature white spruce trees indicated that radial growth has shown a steady decline for the past 10 years.

Egg sampling was carried out at 16 locations in the main infestation area around Namew Lake in northern Manitoba and Saskatchewan. The counts were high at all locations and little change in the infestation is expected in 1961.

The following table shows the frequency of occurrence of spruce budworm larvae in collections from spruce and balsam fir in various forest districts during the period of larval activity.

District	Collections from spruce and balsam fir	Percentage of collections containing spruce budworm	
		1959	1960
Manitoba			
Southern	84	8	7
Eastern	147	25	24
Northern	67	30	30
Western	92	10	14
Saskatchewan			
Hudson Bay	60	19	0
Prince Albert	41	0	5
Meadow Lake	63	0	2
Northern	43	4	5
Southern	36	18	33
West-Central	8	0	0

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—The accompanying infestation map is based on ground and aerial surveys using the classification defined by Nairn and Prentice†.

In Saskatchewan, the main body of severe infestation is still centred north of the Churchill River Basin. Severe defoliation was recorded in all tamarack stands north to the Northwest Territories and west to the Alberta boundary. A resurgence of sawfly population levels was evident in the southeastern part of the Prince Albert District, following five to six years of very light attack. The general increase recorded in the Northern District of Manitoba in 1959 continued in 1960 and severe infestations are now known to extend from the north end of Lake Winnipeg to the Churchill River. Conditions north of the Churchill are unknown as aerial survey coverage was incomplete in 1960.

The status of the larch sawfly in southern areas of the two provinces remained substantially unchanged. Scattered moderate to severe infestations were recorded throughout the Interlake region and in the Western and Southern districts of Manitoba.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—Surveys for the past three years have indicated a gradual increase in the incidence of tent caterpillar collections throughout the region. In 1960, larvae were relatively common in most of the trembling aspen stands examined, and a number of local infestations were reported, usually restricted in size to less than one township (see accompanying map).

As forecast in 1959, trembling aspen was completely defoliated in the East and Central blocks of the Cypress Hills Provincial Forest. The West Block remained relatively free from attack. The most noteworthy increases occurred in the Northern districts of Manitoba and Saskatchewan, where at least 12 widely scattered pockets of severe defoliation were mapped during aerial surveys. Similar local conditions were recorded at Amyot Lake and Sandy Lake in the Prince Albert National Park; south of Ashville in the Riding Mountain National Park; and at Manigotagan, Caribou, Wallace, and Family lakes in the Eastern District of Manitoba.

Intensified egg band surveys were carried out during the fall, particularly in accessible areas of high population concentrations, as a means of following the possible spread and coalescence of spot infestations and to forecast defoliation for 1961. Egg sampling data are summarized by regions in the following table.

Region	No. of sample stations	No. of stations at which egg bands were recorded	Av. no. of bands per tree*	Defoliation Forecast
Manitoba				
Eastern District	6	5	15	Severe
Whiteshell For. Res.	4	3	1	Light
Western District	11	6	1	Light
Riding Mountain N.P.	8	2	3	Light
Northern District	11	7	4	Moderate
Saskatchewan				
Southern District	3	0	0	Nil
Cypress Hills P.F.	17	15	12	Severe
Prince Albert District	18	6	9	Moderate
Prince Albert N.P.	3	1	23	Severe
Northern District	3	0	0	Nil
Meadow Lake District	15	13	2	Light
Hudson Bay District	16	3	1	Light
West-Central District	20	1	1	Light

*Based on examination of three co-dominant trees at each sample station.

†Nairn, L. D. and R. M. Prentice. 1960. Infestation ratings of the larch sawfly in Manitoba and Saskatchewan. Forestry Chron. 36:225–229.

In general the pattern of infestation is expected to be about the same as 1960. Pockets of moderate to severe defoliation are forecast for the Eastern, Western, and Northern districts of Manitoba, and the Prince Albert, Meadow Lake and probably Northern districts of Saskatchewan. Despite a 50 per cent reduction in egg bands in the Cypress Hills Provincial Forest the infestation in this area will continue to cause severe defoliation. These forecasts are based on a normal hatch and survival of larvae in the spring of 1961.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlkr.)—A further decline in numbers of this leaf roller was recorded in 1960, but infestations still persist in parts of the aspen grove region. The most extensive infestation was located south and east of Prince Albert, where aspen stands were severely defoliated over an area of approximately 350 square miles. A smaller infestation covering 35 square miles occurred at the north end of Candle Lake in the Prince Albert District. Larvae were again common through the Riding Mountain National Park and the Duck Mountain Forest Reserve, where defoliation was generally light to moderate. Throughout these areas the leaf roller was frequently found in association with the forest tent caterpillar. The infestation in the Porcupine Provincial Forest has subsided, and defoliation in 1960 was restricted to a relatively small area in the vicinity of Reserve, Saskatchewan.

The following table shows the frequency of occurrence of aspen tortrix larvae in collections from trembling aspen.

District	Collections from trembling aspen	Percentage containing large aspen tortrix	
		1959	1960
Manitoba			
Southern	71	13	7
Eastern	115	15	5
Northern	29	14	7
Western	103	55	21
Saskatchewan			
Hudson Bay	129	53	9
Prince Albert	163	11	21
Meadow Lake	152	7	5
Northern	55	17	18
Southern	197	9	0
West-Central	56	46	27

Jack-pine Budworm, *Choristoneura pinus* Free.—Severe infestations of the jack-pine budworm, each covering approximately 20 square miles, occurred in the Stead–Belair area in eastern Manitoba and north of Arborg in the Interlake region. Numbers remained very low throughout the old infestation areas in the Sandilands and Spruce Woods forest reserves in Manitoba, and the Fort a la Corne and Nisbet provincial forests in Saskatchewan.

The following table shows the frequency of occurrence of the budworm in 1959 and 1960 larval collections.

District	Collections from jack-, lodgepole and Scots pine	Percentage of collections containing jack-pine budworm	
		1959	1960
Manitoba			
Southern	82	36	10
Eastern	73	15	15
Northern	25	0	0
Western	12	5	0
Saskatchewan			
Hudson Bay	22	0	0
Prince Albert	80	4	9
Meadow Lake	57	0	0
Northern	16	0	0
Southern	3	7	0
West-Central	1	0	0

Fall Cankerworm, *Alsophila pometaria* (Harr.)—This cankerworm is the principal defoliator of Manitoba maple in farm shelterbelts and parkland areas. In recent years sampling studies have been carried out to provide a more refined classification of infestations and as a means of forecasting defoliation and damage. Percentage of leaf clusters infested and average number of larvae per infested cluster appear to be satisfactory population indices on this host. The following infestation categories have been established from data gathered to date.

Infestation level	Defoliation rating
85-100 per cent of leaf clusters infested; more than 3 larvae per infested cluster	Severe
30-84 per cent of leaf clusters infested; 1 to 3 larvae per infested cluster	Moderate
Less than 30 per cent of leaf clusters infested; generally not more than one larva per infested cluster	Light

High population levels of the fall cankerworm in 1960 were confined to southwestern Saskatchewan. Severe defoliation of Manitoba maple was observed in farm shelterbelts and townsites at Swift Current, Success, Maple Creek, Ernfold, Beverly, Centaur, Stewart Valley, and Elrose. Trees that have been severely defoliated for the past four years at Swift Current and Success are showing considerable branch mortality. In Manitoba, the infestation reported in 1959 in the park area at Virden completely subsided.

White Grubs, *Phyllophaga* spp., *Serica* spp.—No measurable change occurred in white grub numbers in afforestation areas in the Agassiz Forest Reserve. As in 1959, sampling indicated an average of 1.6 grubs per square foot soil sample. Past records indicate that counts of this order can cause serious losses to pine transplants. Co-operative studies with the Manitoba Forest Service were continued to assess the control value of sod removal prior to planting. Plots treated in this manner have shown a reduction from an average of 3.3 grubs per square foot prior to treatment in 1958 to 0.3 in 1959 and 0.1 in 1960.

Sampling records together with more intensive studies by G. L. Warren have thrown additional light on the life histories of several of the species occurring in this area. Of the two major genera, species of *Serica* are characterized by a three-year life cycle, while species of the more destructive *Phyllophaga* appear to require four years. These findings necessitate a revision of flight-year forecasts included in the 1959 Report. It now appears that the major flight year for *Serica* spp. will be 1961, whereas that for *Phyllophaga* spp. will probably be 1962. Sampling data for 1960 show that 60 per cent of grubs present were large larvae of *Phyllophaga* spp. Since the greatest damage to planting stock is caused by these late-instar larvae, it will not be advisable to plant in the Agassiz Forest Reserve before 1962.

Surveys carried out in the extensive pine plantings in the Big River Provincial Forest in Saskatchewan again failed to reveal the presence of white grubs.

Balsam-fir Sawfly, *Neodiprion abietis* complex—Serious damage to balsam fir and in some cases white spruce foliage was recorded at many points in eastern and northern Manitoba. This is the first Survey record of a widespread outbreak of these sawflies in the forested areas of this region. The feeding damage is very striking; individual needles are notched and never completely consumed. Severe attacks on balsam fir, the most seriously affected host, result in the killing and subsequent reddening of most of the foliage, except for current shoots. Characteristic vividly red stands were most conspicuous on islands and shorelines of larger lakes. Extensive balsam fir mortality can be expected if the infestations continue.

The most noteworthy infestation occurred on Hecla Island and along the shore of Washow Bay on Lake Winnipeg, where balsam fir was heavily attacked over an area of approximately 600 square miles. Elsewhere in the Eastern District small but severe infestations were reported in the Whiteshell Forest Reserve and at Stevenson, Molson, and Beaverhill lakes. In the Northern District of Manitoba infestations were centred in the Setting, Cross, and Sipiwesk lakes areas. There was no appreciable change in the status of these sawflies in the Southern and Western districts of Manitoba or in Saskatchewan.

Yellow-headed Spruce Sawfly, *Pikonema alaskensis* (Roh.)—This sawfly remains the major pest of shelterbelt and ornamental white spruce plantings in the aspen grove and prairie regions. Moderate to severe defoliation was reported in Saskatchewan in the Kenosee Lake area for the third successive year, and at Goodeve, Melfort, and Crystal Springs.

As in 1959, a general increase was noted in the distribution and abundance of this species in forested areas. Severe defoliation of the old and new growth of black spruce occurred in the Pravda and East Braintree areas in southeastern Manitoba. This sawfly was usually found in association with the balsam-fir sawfly on white spruce and black spruce in the severe infestations of the latter species in the Interlake region. Complete defoliation of black spruce was reported at Bailey, Syntak, and Deschambault lakes in the Northern District of Saskatchewan. The infestation of three years standing at Wollaston Lake subsided after extensive tree mortality. Infestations of this sawfly, like those of the balsam-fir sawfly, often demonstrate a unique pattern of distribution in being restricted to islands and shorelines of larger lakes.

Pine Root Collar Weevil, *Hylobius radicis* (Buch.)—An infestation of this weevil was first reported in the Sandilands Forest Reserve in the spring of 1955. During the past five years all Scots and lodgepole pine plantings within a radius of 10 miles of the original infestation have become heavily infested. Tallies in permanent study areas have indicated an average of 50 per cent tree mortality, and some plantings are considered a complete loss.

Examination of infested root collars in 1960 showed almost complete absence of weevils, although all trees had a heavy accumulation of old damage. The reasons for this sudden disappearance are not yet apparent. Observations and tallies will be continued in permanent study areas to detect any recurrence of the weevil, and to determine the ability of trees to recover following three to four years of heavy attack.

Detection surveys are being continued in the extensive pine plantings of the Spruce Woods Forest Reserve and in the Prince Albert District where the weevil is not yet known to occur.

Grey Willow-leaf Beetle, *Galerucella decora* Say—A severe infestation occurred through the southern part of the Sandilands Forest Reserve and in the Sprague–Middleboro areas in southeastern Manitoba. Patches of skeletonized willow were common in the Belair and Whiteshell forest reserves, the Interlake region, and east of Lake Winnipeg. Elsewhere in the two provinces larvae of this beetle were common, but caused little damage.

Spiny Elm Caterpillar, *Nymphalis antiopa* (L.)—Larvae were unusually abundant on a variety of host trees in 1960. Up to 70 per cent defoliation of willow was recorded at some locations in southeastern Manitoba. Trembling aspen was heavily attacked at widely scattered points in the Riding Mountain National Park. White elm appeared to be the preferred host in Saskatchewan where light to moderate defoliation was reported at Salvador, Battleford, and Moose Mountain Provincial Park.

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Boxelder Twig Borer, *Proteoteras willingana* (Kft.)—Infestations of this insect caused light damage in both provinces for the third consecutive year. This was indicated by counts made at 25 sample stations established in 1956 and described in the 1959 Report.

White-pine Weevil, *Pissodes strobi* (Peck)—The only notable change in weevil attack was in the Sandilands Forest Reserve where up to 20 per cent of the leaders of 12 to 15 year old jack pine plantings were heavily infested. Confirmation has not yet been received of the occurrence of 'strains' of this species in the Prince Albert area, as outlined in the 1959 Report.

A Pine Tip Moth, *Rhyacionia* sp.—This undetermined tip moth was common on the current shoots of jack pine in southeastern Manitoba. Damage was characterized by the browning and dying of the terminal 3 or 4 inches of current growth. Counts at five points in the Southern District showed that 12 to 34 per cent of lateral shoots were infested. Rearings are under way to produce adult specimens for specific identification.

Pine Needle Scale, *Phenacaspis pinifoliae* (Fitch)—Infestations on ornamental and shelterbelt white spruce trees in southern Manitoba and Saskatchewan continued to decline. Although not generally considered a pest in forested areas, this scale occurred in high numbers on individual open-growth trees in the northern part of the Sandilands Forest Reserve.

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Evagora sp.....	Lodgepole pine	Cypress Hills Provincial Forest.	Present in low numbers, less numerous than in 1959.
Gonioctena americana (Schffr.)	Trembling aspen	Prince Albert District, Sandilands F.R.	Patches of severe defoliation of young trees.
Saperda calcarata Say..	Trembling aspen	Prince Albert, Northern, and Meadow Lake districts.	Caused up to 40 per cent mortality of small aspen on poor sites.
Oligonychus ununguis (Jac.)	White spruce	Aspen Grove and Prairie regions.	Common on ornamentals and shelterbelts, usually in association with the pine needle scale.
Toumeyella numismaticum (P. & M.)	Jack pine and Scots pine	Sandilands F.R., Hudson Bay and Prince Albert districts.	Individual trees heavily attacked in natural stands and plantations.
Pulvinaria innumerabilis (Rathv.)	Manitoba maple	Greater Winnipeg area.	Found in very low numbers, infestation completely subsided.
Eupithecia gibsonata Tayl.	Cedar	Sandilands F.R.	Found in unusually high numbers at several points.
Arge pectoralis (Leach).	White birch	Northern District of Manitoba	Moderate defoliation at a number of points.
Lecanium corni Bouche.	White elm	Southern District of Saskatchewan.	Occurred in high numbers in two areas on planted elms.
Sparganothis tristriata Kft.	Jack pine	Prince Albert District.	Up to 35 per cent defoliation of current growth in plantations in the Buckland area.
Tetralopha asperatella Clem.	Trembling spen	Duck Lake, Saskatchewan.	Local infestations caused heavy defoliation.
Compsolechia niveopulvella Cham.	Trembling aspen	Hudson Bay District.	Infestation reported in 1959 subsided.
Semiothisa granitata Gn.	Balsam fir and Black spruce	Northern District of Manitoba.	Found in high numbers, at some locations associated with *Neodiprion abietis*.
Nematus limbatus Cress.	Willow	Sandilands, F. R.	Moderate defoliation at scattered locations.
Pleroneura borealis Filt	Balsam fir	Prince Albert and Northern districts.	Common, but causing no extensive damage.

OTHER NOTEWORTHY INSECTS—Concluded

Insect	Host	Locality	Remarks
Neodiprion virginianus complex	Jack pine	Southeastern Manitoba.	Marked increase in numbers; up to 60 per cent defoliation at some points.
Pontania sp.....	Balsam poplar	Prince Albert District.	No apparent change in status.
Schizura concinna A. & S.	Trembling aspen	Prince Albert N.P., South-central Saskatchewan.	Severe defoliation of individual open-growing trees at a number of locations.
Petrova albicapitana (Busck)	Plantation jack pine	Bronson P.F., Saskatchewan.	Up to 50 per cent of the trees showing nodule damage.
Pineus strobi Htg.....	White pine	Southeastern Manitoba.	Damage not as conspicuous as in 1959

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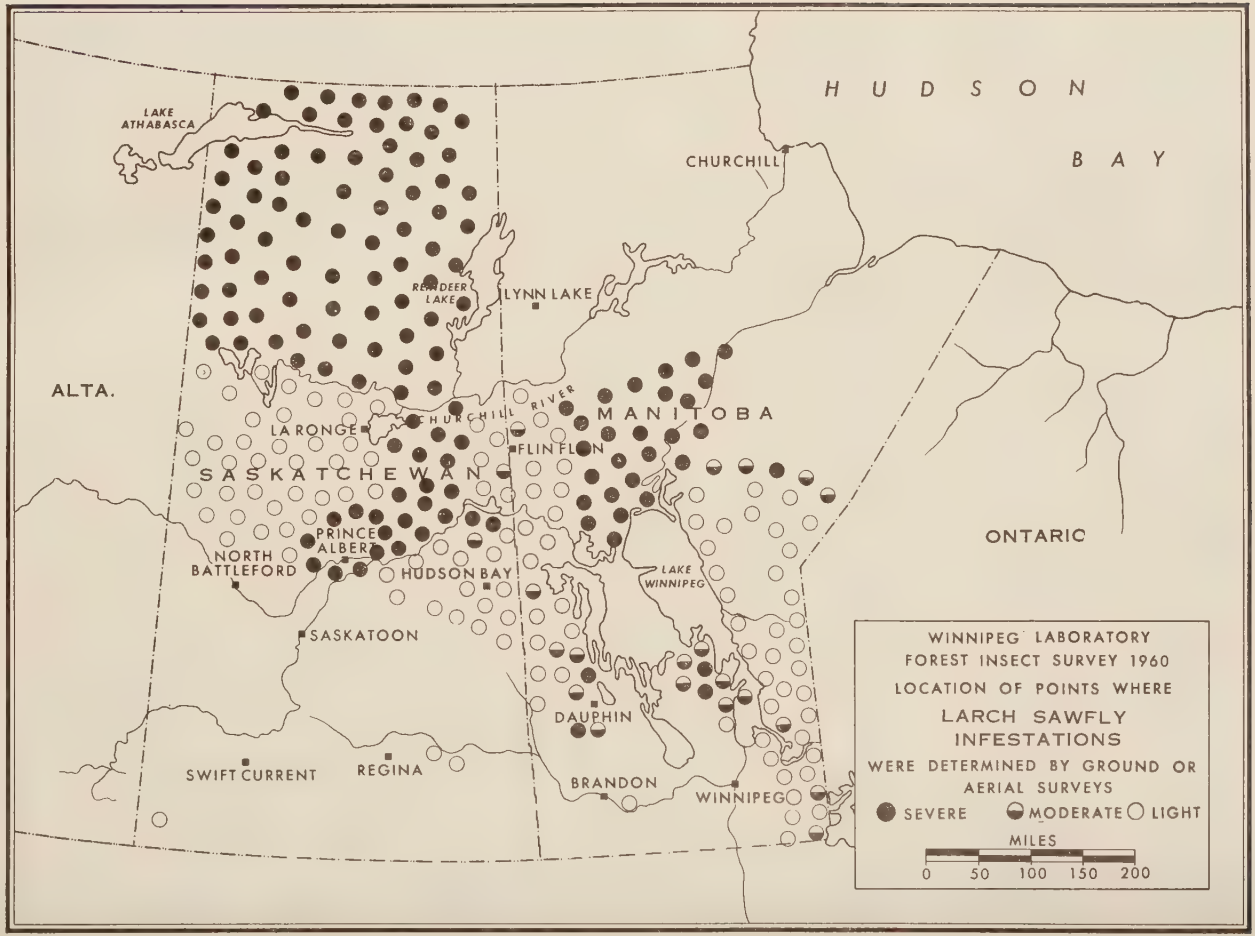
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SASKATCHEWAN
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NORTH BATTLEFORD
HUDSON BAY
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FOREST INSECT SURVEY 1960
LOCATION OF POINTS WHERE
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WERE DETERMINED BY GROUND OR
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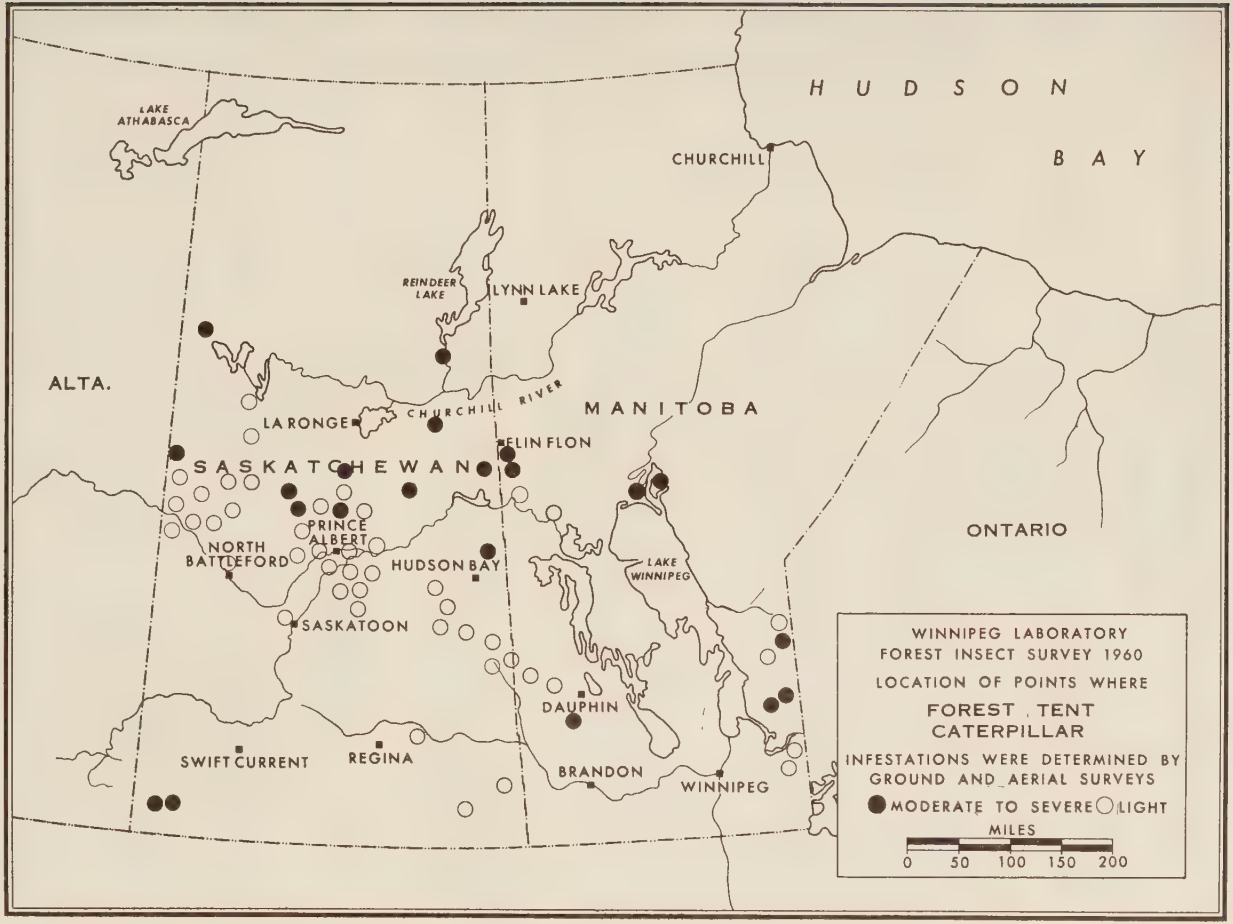
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FOREST INSECT SURVEY 1960
LOCATION OF POINTS WHERE
FOREST TENT CATERPILLAR
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MODERATE TO SEVERE
LIGHT
MILES
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PROVINCES OF MANITOBA AND SASKATCHEWAN

FOREST DISEASE SURVEY

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INTRODUCTION

Weather conditions in most of Manitoba and Saskatchewan in 1960 were highlighted by prolonged and above-normal moisture in the preceding autumn, followed by abrupt and severe freezing temperatures. In contrast, spring weather conditions were mild, and abundant precipitation fell in most of the region except in southern Manitoba where the rainfall in June amounted to less than half the normal. July and early August were dry, with record-breaking heat; most meteorological stations reported moisture deficiencies ranging to 80 per cent. At The Pas only 0.40 inches of rain fell in August, the lowest since 1912. Other stations in the northern half of Manitoba experienced smaller deficiencies, but in the southern half of the Province abundant rainfall ended the drought on August 2.

The growing season, in addition to beginning several days earlier, extended into the fall, making it one of the longest on record.

The conditions described above were reflected in the incidence of non-pathogenic diseases noted below.

The distribution of collections by principal host trees was as follows:

Coniferous Trees	Collections	Broad-leaved Trees	Collections
Black and white spruce	329	Trembling aspen	98
Jack pine	99	Willow	28
Balsam fir	22	Balsam poplar	17
Scots pine	3	Elm	16
		Manitoba maple	10

Miscellaneous hosts 63

Grand Total 685

IMPORTANT DISEASES

Winter Injury—A number of species of hardwood trees and shrubs, notably Manitoba maple, elm, and honeysuckle, in the southern agricultural region of Manitoba, were affected by a combination of environmental conditions. Some trees failed to leaf out in the spring, and died. Others developed early stages of foliage and blossom clusters, which then wilted and died. Die-back was a common symptom. The symptoms suggested that the primary cause was failure of roots to deliver sufficient water to the above-ground parts, and examination showed that at least some roots had died recently. These symptoms were similar to those known to be caused by abrupt cold weather the preceding autumn. The cambium of young branches and also of roots near the ground surface can be killed by premature low temperatures. In one row of elms the most severely affected trees were on low, poorly drained ground, where shallow rooting could be expected. The winter injury was followed by leaf scorch (described below) which tended to confuse these two types of injury.

Leaf Scorch—Leaf scorch of aspen was first observed in July, and became more conspicuous during August throughout the forested regions in Manitoba and Saskatchewan. A dark green discoloration began at the tip of the leaf and progressed downward into the petiole which became blackened and shrunken. The leaf eventually became dry and brittle, the colour changing slowly from dark green to yellow and then to red-brown. In cases where death of a twig was abrupt, the leaves turned from dark green to deep brown without any progressive discoloration. Usually all the leaves in a cluster were affected.

Leaf scorch was associated with an abrupt change from very favourable conditions for growth to a prolonged period of unusually high temperature and drought. This condition coincided with severe 'burning' of cereal crops ascribed to the same conditions.

Leaf scorch in aspen was accompanied by twig abscission in the Candle Lake region; this is believed to be a more extreme effect of the same climatic conditions. Some twigs were shed while all leaves were still living and green; others were shed after the leaves had turned yellow or reddish-brown.

Other deciduous trees affected by leaf scorch were bur oak, ash, birch, alder, Manitoba maple, and willow.

Winter Browning—Winter browning was light throughout the region. This fact, coupled with the unusually abundant rainfall of the preceding autumn, supports the common belief that ample autumn soil moisture tends to prevent this disease.

Wind Damage—During July wind storms caused considerable breakage and uprooting in several localities. On July 10 conspicuous damage was caused at Spruce Woods Forest Reserve, Manitoba, where windthrow and branch breakage occurred, particularly in plantations of Scots pine. In the latter part of July considerable damage occurred in cut-over poplar and spruce stands at Green Lake, Ile-à-la Crosse, Loon Lake, Doré Lake, Sled Lake, and Candle Lake, Saskatchewan.

Hail Damage—In early June moderate defoliation of poplars by hail occurred in the community of Caragana, Saskatchewan. On July 10 severe wind and hail caused considerable defoliation and bark wounding of aspen and bur oak at Spruce Woods Reserve, Manitoba.

Root and Butt Rots, *Polyporus tomentosus* Fr.—The special survey for *Polyporus tomentosus* was continued, and 16 stands of spruce were systematically sampled. Additional records of the occurrence of *P. tomentosus* decay were obtained from Riding Mountain National Park in Manitoba. New locations of the disease include Fontaine, Herbert, Hatchet, Bar, Loon lakes and Wheatley and Smeaton, Saskatchewan. The disease has now been recorded in 41 of the 55 stands sampled.

Root and Butt Rot, *Flammula alnicola* (Fr.) Quél.—The special survey for *Flammula alnicola* was continued. Approximately 500 stumps were examined in 10 cut-over areas; out of 30 samples submitted for final determination, one sample, collected at White Fox, Saskatchewan, was positive.

Elm Canker—Cankers and wilt of planted white elms occurred at Assiniboine Park, and at Tuxedo, Winnipeg, and Saskatoon. Wilting did not appear until the hot, dry weather of July and August. From elm *Cephalosporium* and *Dothiorella ulmi* Verrall & May were isolated consistently from all specimens. These are respectively the hyphomycetous stage and pycnidial stage of the same fungus.

Leaf Spots—Light incidence of ink spot caused by *Ciborinia whetzelii* (Seaver) Seaver, and Melanconium leaf blight of aspen occurred in most parts of northern Manitoba and Saskatchewan. Over the same area tar spot of willow caused by *Rhytisma salicinum* (Pers.) Fr. was very abundant.

Twig Blight, *Napicladium tremulae* (Frank) Sacc.—Twig blight of aspen was more common than in previous years in many parts of northern Saskatchewan and Manitoba.

Rust—Light infection of spruce needles by Chrysomyxa rust was observed in both Provinces. *Puccinia coronata* Cda. associated with crown rust of wild grasses (alternate hosts) was collected on alder buckthorn at Lac La Ronge, Saskatchewan. Leaf rust of aspen caused by *Melampsora medusae* Thüm was found at Cudworth, Saskatchewan, about 35 miles from the nearest tamarack tree.

OTHER NOTEWORTHY DISEASES

Host	Organism	Locality	Remarks
Ash, green	*Phyllosticta* sp.	Pointe du Bois, Man.	First host record for the district.
Ash, mountain	*Gloeosporium* sp.	White Lake, Man.	First record for Manitoba.
Aspen	*Fomes igniarius* (L. ex Fr.) Kickx	Moose L., Man.	First record for the district.
	Macrophoma tumefaciens Shear	Pinawa, Rennie, and Red Rock L., Man.	First record for the district.
	Septogloeum sp.	Lavallee L., Sask.	First record for Saskatchewan.
	Gloeosporium sp.	Pointe du Bois, Man.	First record for the district.
	Late frost	Melfort, Sask.	Damage to foliage.
Birch, white	*Fomes igniarius* (L. ex Fr.) Kickx	Moose L., Man.	First record for the district.
Fir, balsam	*Melampsorella caryophyllacearum* Schroet.	Pointe du Bois, Man.	First record for the district.
	Pucciniastum geoppertianum (Kuehn) Kleb.	Wallace L., Man.	First record for the district.
	Stereum sanguinolentum Alb. and Schw. ex Fr.	Manigotagan L., Man.	First record for the district.
Maple, manitoba	*Septogloeum* sp.	Colonsay and Goodsoil, Sask.	First record for Saskatchewan.
Oak, bur	*Gloeosporium* sp.	White Lake, Man.	First record for the district.
Poplar, balsam	*Septoria musiva* Pk.	Beresford L., Man.	First record for the district.
Spruce, white	*Polyporus tomentosus* Fr.	Loon L., Sask.	First record for the district.
Willow	*Gloeosporium* sp.	Pierce Lake, Sask.	First record for Saskatchewan.

PROVINCE OF ALBERTA

FOREST INSECT SURVEY

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INTRODUCTION

The larch sawfly and the forest tent caterpillar were the two most widely distributed and destructive insects in the Alberta Region in 1960. The larch sawfly caused severe defoliation from Great Slave Lake in the Northwest Territories south through the eastern part of Alberta to Township 62. The forest tent caterpillar defoliated large areas of aspen in east-central Alberta and in the Peace River Block. The Bruce spanworm, active over much of central and southern Alberta for the past few years, was almost absent in 1960. The numbers of leaf rollers on aspen were greatly reduced. The spruce budworm infestation in the Northwest Territories showed the patchy defoliation pattern which has typified this infestation for approximately eight years.

The upper portion of the Mackenzie River was surveyed by boat and the area south and west of Great Slave Lake by truck. An expanded road system allowed access to the forests around the west end of Great Slave Lake. In Wood Buffalo Park surveys were greatly facilitated by the use of aircraft supplied by the Department of Northern Affairs and National Resources.

Provincial, federal, and industrial personnel co-operated generously in making collections and assisting Forest Biology rangers. A total of 1,713 collections were received and are summarized by host as follows:

Coniferous Trees	Collections	Broad-leaved Trees	Collections
White spruce	283	Trembling aspen	663
Tamarack	144	Willow	100
Lodgepole pine	139	Balsam poplar	50
Jack pine	30	Manitoba maple	47
Black spruce	26	Alder	40
Englemann spruce	15	Rose	26
Douglas fir	14	Birch	19
Alpine fir	11	Chokecherry	17
Limber pine	8	Saskatoon	7
Balsam fir	8	Caragana	5
Western larch	3	Dogwood	4
Total	681	Total	978
Miscellaneous hosts	54		
Grand Total	1,713		

IMPORTANT INSECTS

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—There was little change in the outbreaks reported throughout most of the range of tamarack in Alberta in 1959. In the Northwest Territories the known distribution was extended to 46 miles north of Fort Providence on the Yellowknife Highway. The distribution and intensity of infestations of the larch sawfly are shown on the accompanying map. Severe defoliation was observed farther north and west than in 1959 and covered a large area in northern Alberta and the adjacent Northwest Territories. The area

of severe defoliation lay west of a line through Graham Lake, Lac la Biche, and Lesser Slave Lake, to the south shore of Great Slave Lake. The western boundary extended from the west end of Lesser Slave Lake through Fort Vermilion and the eastern edge of the Cameron Hills to Pine Point. The northeastern boundary lay half way between the Slave and Talston rivers and extended south to the Alberta Border. Other small areas of severe infestation were reported from the Sylvan Lake–Caroline–Rocky Mountain House area and near Elk Island National Park.

Moderate defoliation occurred in a large area bounded by Mackay, Westlock, Fawcett, and Lesser Slave lakes. Moderate infestations were also reported from widely separated locations throughout the remainder of the infested area. Defoliation of the remainder of the tamarack in the Province ranged from a trace to light. Western larch stands south of Kananaskis Lakes in the Bow River Forest Division were lightly infested.

The results of sequential sampling of twigs utilized for egg laying are given in the following table:

Location	Infestation Class			Location	Infestation Class		
	1958	1959	1960		1958	1959	1960
High Level	light	nil	light	Spedden	moderate	nil	nil
Keg River	nil	nil	moderate	Barrhead	severe	severe	severe
Clear Prairie	moderate	light	nil	Obed	nil	nil	light
Grimshaw	nil	light	moderate	Gainford	moderate	light	light
Watino	severe	moderate	moderate	Edmonton	severe	moderate	light
Grouard	light	light	light	Peers	nil	light	light
Slave Lake	moderate	light	moderate	Muskeg River	nil	nil	nil
Calling Lake	moderate	moderate	nil	Mercoal	nil	light	moderate
Grande Prairie	light	light	light	Millet	moderate	light	light
Lac la Biche	moderate	light	nil	Winfield	moderate	light	light
Flatbush	moderate	moderate	moderate	Nordegg	light	light	moderate
Cold Lake	light	light	nil	Rocky Mtn. House	light	severe	severe
Iosegun Lake	light	nil	light	Clearwater	moderate	moderate	severe
Perryvale	light	severe	light	Caroline	light	moderate	light
Whitecourt	severe	moderate	light	Miette	—	—	light

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—Spruce budworm population levels in the Mackenzie Valley increased at many points in 1960 following a general decline in 1959. Severe damage to white spruce occurred around the mouth of the Blackwater River. Moderate damage was evident from the Fort Simpson Settlement to the airport, in patches between Old Fort Island and Smith River, between the Ochre and Johnson rivers and from Old Fort Point to Fort Norman. The infestation along the Liard River was not visited in 1960. The outbreak along the Slave River continued unabated with moderate to severe damage occurring in an area 20 miles downstream from the mouth of the Salt River and around Long Island. Light to moderate damage to scattered stands of white spruce northwest and southeast of Loon Lake in north-central Alberta was attributed to the spruce budworm.

In the Cypress Hills, little change in the extent or intensity of the outbreak was evident. Light to moderate damage to white spruce occurred along Battle and Grayburn creeks and southward to the boundary of the Elkwater Provincial Park.

Low population levels of the two-year-cycle spruce budworm persisted in Yoho National Park from Boulder Creek to Emerald Lake. Low to medium population levels were found along the Saskatchewan River from Saskatchewan Crossing to about 6 miles east of the boundary of Banff National Park.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—The current outbreak of the forest tent caterpillar which began in 1957 continued to expand in 1960. In a few areas in the Grande Prairie region unfavourable weather soon after

hatching caused a reduction in the number of larvae but throughout most of the central and northwestern parts of the Province, infested areas were larger and defoliation more severe than in 1959.

The area of heavy defoliation reported near Elk Point in 1958 expanded to 4,000 square miles in 1960. This area was bounded on the south by Highway 14 from Manville to Vermilion, on the east by Leighton, Bonneyville, and Wolf Lake, on the north by Spencer and Kinnaird lakes, and on the west by Rich Lake, St. Paul, and Morcambe. Smaller areas of heavy defoliation occurred near Ashmont, Boyle, Wandering River, between Cold and Tucker lakes, and along the south shore of Cold Lake. Large areas of moderate defoliation occurred to the east and west of the area of heavy defoliation.

In the Peace River region heavy defoliation occurred along the Peace River from the mouth of the Cadotte River to 10 miles southwest of Fort Vermilion. This area was approximately 20 miles wide. Farther south heavy defoliation was reported from Bluesky to Cardinal Lake; in a triangle bounded by Peace River Donnelly, and Watino, and near Sturgeon Lake. Smaller areas of moderate and heavy defoliation occurred throughout the Peace River region. Moderate to heavy infestations were reported in the Whitecourt–Blue Ridge area, southeast of Little Smoky Settlement and around Fawcett Lake. Details of these areas and the lightly defoliated areas are shown on the accompanying map.

Predicted defoliation for 1961 based on sequential sampling of forest tent caterpillar egg bands is presented in the following table. The defoliation in 1960 is also given. In the table a prediction of 'not noticeable' corresponds to light or nil defoliation and a prediction of 'noticeable' to moderate or heavy.

Location	Defoliation 1960	Predicted defoliation 1961	Location	Defoliation 1960	Predicted defoliation 1961
Whitelaw	moderate	noticeable	Debolt	moderate	noticeable
Peace River	heavy	noticeable	Sturgeon Lake	moderate	noticeable
Dixonville	nil	not noticeable	High Prairie	nil	not noticeable
Manning	nil	not noticeable	Driftpile	light	not noticeable
McLennan	nil	not noticeable	Slave Lake	nil	not noticeable
Donnelly	heavy	noticeable	Fawcett Lake	heavy	not noticeable
Lac La Biche	nil	not noticeable	Huallen	light	not noticeable
Grassland	light	not noticeable	Demmitt	light	not noticeable
Calling Lake	light	noticeable	Baytree	nil	not noticeable
Athabasca	light	not noticeable	Spirit River	nil	not noticeable
Rochester	light	noticeable	Tangent	nil	not noticeable
Ashmont	moderate	noticeable	Grovedale	nil	noticeable
Elk Point (N)	heavy	noticeable	Blue Ridge	heavy	noticeable
Elk Point (S)	moderate	noticeable	Whitecourt	heavy	noticeable
Dewberry	heavy	noticeable	Little Smoky	light	noticeable
Vermilion (N)	moderate	noticeable	Lavoy	—	not noticeable
Vermilion (S)	light	noticeable	Edgerton	—	not noticeable
Mannville	light	noticeable	Fabyan	—	not noticeable
Two Hills	moderate	noticeable	Mundare	—	not noticeable
Andrew	light	not noticeable	Edmonton	—	not noticeable
Star	light	not noticeable	Provost	light	not noticeable
Warspite	moderate	not noticeable	Rivercourse	light	not noticeable
Vilna	nil	not noticeable	Ribstone	light	not noticeable
Brierville	light	not noticeable	Hughenden	light	not noticeable
Lyle Lake	light	not noticeable	Lougheed	light	not noticeable
Beauvallon	heavy	noticeable	Phillips	light	not noticeable
Cold Lake	heavy	noticeable	Ellscott	light	not noticeable
Bonnyville	heavy	noticeable			

Aspen Leaf Miner, *Phyllocnistis populiella* Cham.—This insect was found in most aspen stands in Alberta in 1960 although infestations were generally light. The largest area of heavy infestation was in Jasper National Park from Athabasca Falls to approximately 10 miles north of Jasper townsite, westward along the Miette Valley to Geike and eastward to Maligne Canyon. A moderately infested area surrounded the heavy infestation extending north to the Fiddle River Bridge, and east to Medicine Lake. To the south, moderate to light infestations extended to the Park Boundary.

Small areas of heavy infestation were reported from the southern end of Kootenay National Park, the Rat Creek–Cutbank River area, and south of Goodwin. Moderate infestations occured near Hinton and at widely separated locations in the Grande Prairie and Slave Lake forest divisions. Elsewhere infestations were light.

Bruce Spanworm, *Operophterab ruceata* (Hulst)—This insect which has caused severe defoliation to aspen since 1957 was very scarce in 1960. In only two small areas, from Halkirk to Coronation and near Islay, was there any severe defoliation. Elsewhere larvae were present in very low numbers.

Leaf Rollers on Aspen—From 1957 to 1959 a complex of species, *Pseudexentera improbana oregonana* Wlshm., *Choristoneura conflictana* (Wlk.) and *Compsolechia niveopulvella* (Cham.) has been responsible for a great deal of leaf rolling. In 1960 *C. niveopulvella* and *C. conflictana* occurred in Survey collections in numbers similar to those received prior to the outbreak. *P. improbana oregonana* was still present in outbreak numbers in the central part of the Province; it caused heavy leaf rolling near Stony Plain, Saskatoon Lake, Wanham, Woking, and Rycroft. Moderate rolling of leaves occurred northeast of Blue Ridge and in the area between Highways 14 and 45 from the Saskatchewan Border to a line through Camrose and Legal.

Spruce Spider Mite, *Oligonychus ununguis* (Jac.)—The spruce spider mite was more abundant than in 1959. In the Peace River Block severe damage was reported from the Grouard–High Prairie area and near North Star. Light damage was found at Wapiti Settlement, Valleyview, Grande Prairie, Dixonville, Manning, and Hotchkiss. Little damage was reported from central and southern Alberta with the exception of Banff townsite where moderate damage occurred to some hedges and individual trees.

Yellow-headed Spruce Sawfly, *Pikonema alaskensis* (Roh.)—The yellow-headed spruce sawfly caused moderate to heavy damage to spruce shelterbelts and ornamental plantings in the Barrhead–Shoal Creek and Spruce Grove–Stony Plain areas. Light defoliation occurred to planted spruce in Grande Prairie, High Prairie, and in the Woking district. Infestations in farm shelterbelts south of Edmonton were greatly reduced and little damage was observed.

Mature to overmature spruce on an island in the Peace River near the 25th Base Line sustained light to moderate defoliation. Heaviest damage was observed around the shores of the island which was about 5 acres in area. Several reports of severe defoliation to the tops of black spruce were received from widely separated locations in northern Alberta.

Fall Cankerworm, *Alsophila pometaria* (Harr.)—Damage to farm shelterbelts by the fall cankerworm was commonplace in 1960. Severe defoliation of Manitoba maple was reported from Monarch, Turin, Purple Springs, Whitlaw, and Jenner. Light defoliation was evident in many farm shelterbelts between the Red Deer River and the International Boundary.

Engelmann Spruce Weevil, *Pissodes engelmanni* Hopk.—Population levels of the Engelmann spruce weevil remained much the same in 1960 as in 1959. Infestations at Kootenay Crossing continued to damage white spruce trees. Small infestations were reported along the Mackenzie Highway north from Keg River, in Wood Buffalo Park, north of Fort Providence, at Noral, and along the Chief Mountain and Cameron Lake roads in Waterton Lakes National Park.

Leaf Beetles, *Altica populi* Brown, *Chrysomela aeneicollis* (Schaeffer), *Chrysomela semota* Brown, *Gonioctena americana* Schaeff. and *Galerucella decora*

(Say)—Leaf beetles caused defoliation in a number of small widely separated areas. The grey willow leaf beetle, *G. decora*, caused defoliation of willow at Warspite, Clandonald, Valleyview, Fahler, and Devon. The American aspen beetle, *G. americana*, caused severe defoliation of aspen in a small area near Fort Vermilion and moderate damage at Bragg Creek, Priddis, Turner Valley, Seba Beach, and Tomahawk. *A. populi*, caused light defoliation west of Edmonton. The leaf beetle, *C. aeneicollis*, caused severe defoliation to willow at high elevations in Banff and Kootenay national parks.

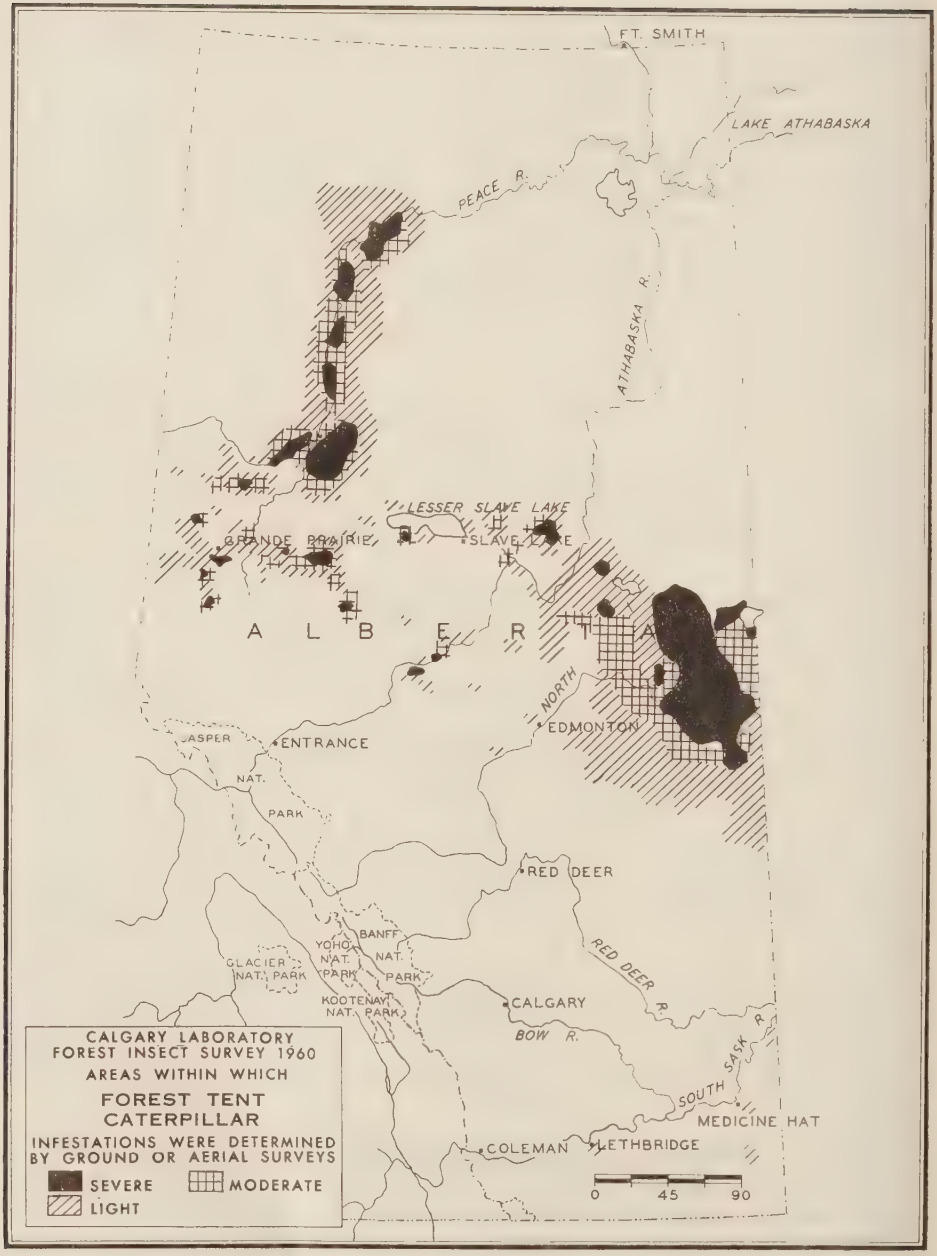
Gall Aphids, *Adelges cooleyi* (Gill.) and *Pineus* prob. *similis* (Gill.)—In 1959 Cooley spruce gall aphids, *A. cooleyi*, were reported in large numbers. These aphids overwintered successfully and large numbers of galls were produced on spruce throughout most of the southern and western parts of the Province in 1960. These galls caused considerable concern to owners of ornamental trees in cities and towns throughout the infested area. Cooley spruce gall aphids on Douglas fir were again reported from Banff townsite in moderate numbers. *P.* prob. *similis* was also frequently reported but was not as plentiful as the Cooley spruce gall aphid.

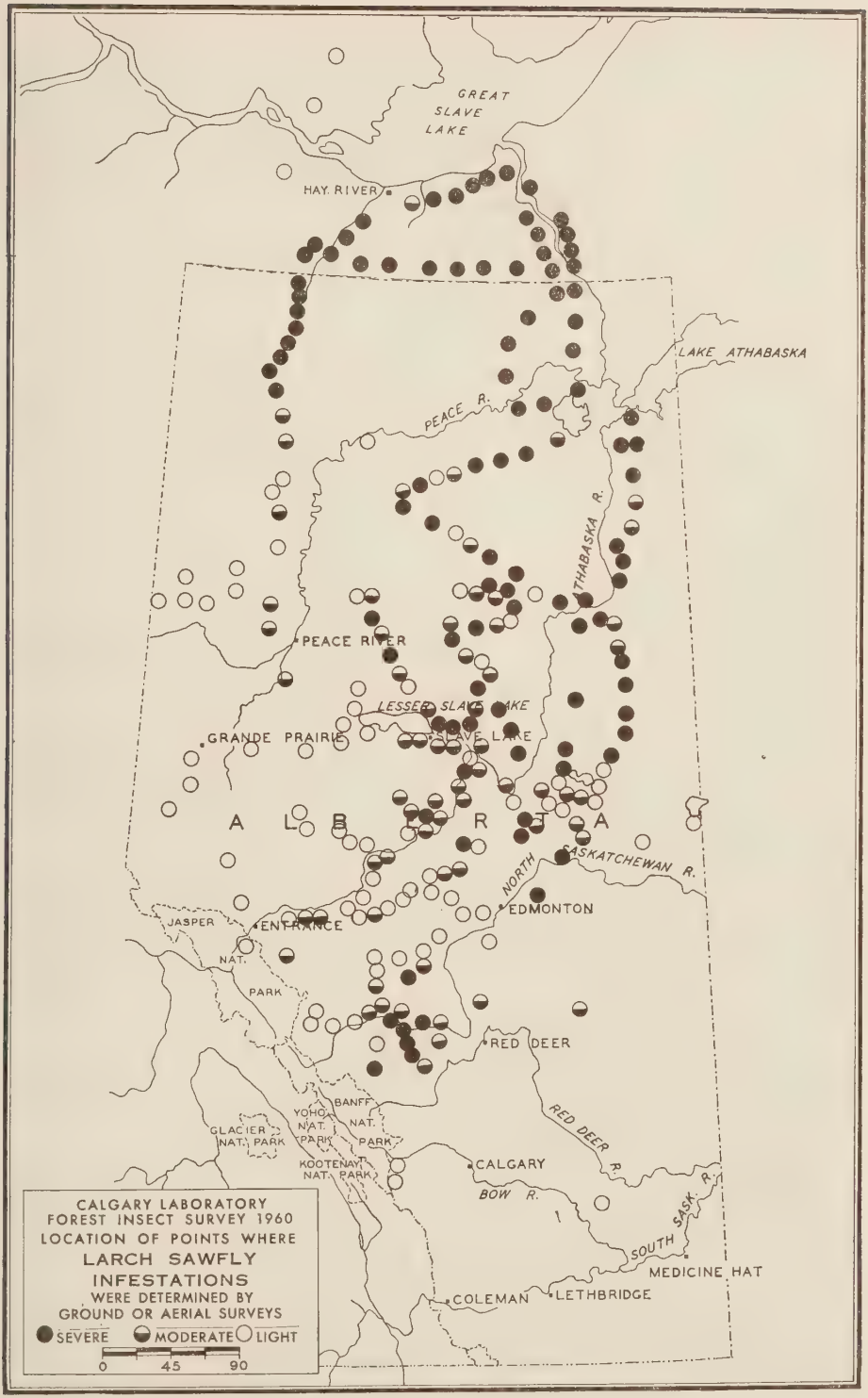
Lodgepole Needle Miner, *Evagora starki* Free.—Lodgepole needle miner numbers have remained relatively constant for the past six years. At the Mount Eisenhower sample plot approximately three times as many eggs (3.28 per tip to 10.39) were found in the 1960 sampling than were found for the previous generation. A twofold increase (3.27 to 5.98) was found in the Mount Girouard sample plot. The population levels in other than the sample areas were too low to indicate a trend.

Bark Beetles, *Dendroctonus pseudotsugae* Hopk. and *Dendroctonus engelmanni* Hopk.—The infestation of the Engelmann spruce beetle on the west branch of the Castle River reported in 1957 and the infestation of the Douglas-fir bark beetle in the Porcupine Hills reported in 1959 were re-examined in 1960. There was little change in the amount of damage in either infestation.

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Acleris variana (Fern.).	Spruce, fir	Alberta and N.W.T.	Little defoliation.
Acyrthosiphon caraganae (Cholod.)	Caragana	Banff, Jasper, and Field, B.C.	Heavy infestations at Field.
Aspidiotus popularum (Marlatt)	Trembling aspen	Warspite	Clumps of trees heavily infested.
Dioryctria reniculella (Grote)	Spruce	Northern Alberta, N.W.T., Cypress Hills	Infestations spotty.
Hemichroa sp.....	Alder	Wandering River	Patches of defoliation in some areas.
Malacosoma lutescens (N. & D.)	Shrubs	Southeastern Alberta	Pockets of light infestation.
Malacosoma pluviale (Dyar)	Shrubs	Alberta	Moderate defoliation in some localities.
Neodiprion spp.....	Douglas fir, lodgepole pine, white spruce	Radium Hot Springs, B.C., West-central Alberta	Widely distributed, population level low.
Periphyllus negundinis (Thos.)	Box-elder	Southern Alberta	Heavy in Calgary.
Phenacaspis pinifoliae	Douglas fir, lodgepole pine	Hillcrest, Radium Hot Springs, B.C.	A few trees infested.
Trichiosoma sp.....	White birch, willow, alder	West-central Alberta	Light, widespread infestations.


FT. SMITH
LAKE ATHABASKA
PEACE R.
ATHABASKA R.
LESSER SLAVE LAKE
GRANDE PRAIRIE
SLAVE LAKE
ALBERTA
NORTH
EDMONTON
JASPER
NAT.
PARK
ENTRANCE
RED DEER
BANFF
NAT.
PARK
YOHO
NAT.
PARK
GLACIER
NAT. PARK
KOOTENAY
NAT. PARK
CALGARY
BOW R.
RED DEER R.
SOUTH SASK R.
MEDICINE HAT
COLEMAN
LETHBRIDGE
0 45 90
CALGARY LABORATORY
FOREST INSECT SURVEY 1960
AREAS WITHIN WHICH
FOREST TENT
CATERPILLAR
INFESTATIONS WERE DETERMINED
BY GROUND OR AERIAL SURVEYS
SEVERE
MODERATE
LIGHT


GREAT SLAVE LAKE
HAY RIVER
LAKE ATHABASKA
PEACE R.
ATHABASKA R.
PEACE RIVER
LESSER SLAVE LAKE
GRANDE PRAIRIE
SLAVE LAKE
ALBERTA
NORTH SASKATCHEWAN R.
EDMONTON
JASPER NAT. PARK
ENTRANCE
RED DEER
BANFF NAT. PARK
YOHO NAT. PARK
GLACIER NAT. PARK
KOOTENAY NAT. PARK
CALGARY
BOW R.
RED DEER R.
SOUTH SASK R.
MEDICINE HAT
COLEMAN
LETHBRIDGE
CALGARY LABORATORY
FOREST INSECT SURVEY 1960
LOCATION OF POINTS WHERE
LARCH SAWFLY
INFESTATIONS
WERE DETERMINED BY
GROUND OR AERIAL SURVEYS
SEVERE
MODERATE
LIGHT
0
45
90

PROVINCE OF ALBERTA

FOREST DISEASE SURVEY

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INTRODUCTION

Disease survey activities during 1960 in the Alberta region were both intensive and extensive depending on the diseases studied. The *Atropellis* canker and dwarf mistletoe diseases of pine were surveyed intensively in certain localized areas to gain information on the amount and type of damage produced. Project leaders aided materially in these appraisals. The distribution of *Peniophora pseudo-pini* Weres. and Gibson (*Stereum pini* (Schleich.ex Fr.) Fr.), the cause of red heartwood stain of pine, was determined by extensive collecting over much of the host range.

The effectiveness of aerial surveys in the detection of dwarf mistletoe was tested and found useful in planning ground surveys.

Drought in the late summer of 1960 caused foliage injury to many coniferous species in the Rocky Mountains and foothills. However, the cold wet spring and early summer provided conditions suitable for the epidemic development of spruce needle rusts in the Whitecourt area. Other foliar diseases were less pronounced and had decreased from 1959.

A survey of cull in white spruce, involving 851 trees, was completed in co-operation with the Alberta Department of Lands and Forests. A similar survey of lodgepole and hybrid pines was begun. A total of 1,150 trees were examined from a hybrid pine area near Whitecourt and from a lodgepole pine area near Grande Prairie.

A total of 1,852 collections were processed during the year comprising 890 disease specimens and 962 cultures of wood-rotting fungi. Four hundred and twenty-eight disease specimens have been identified and 60 were discarded as unidentifiable. Four hundred and twenty-four specimens of wood-inhabiting fungi have been filed for future study. This group largely comprises Thelephoraceae and Fungi Imperfecti. Thirty-nine of the cultures have been identified at the time of writing.

A summary of collections from the different hosts follows:

Coniferous Trees	Collections	
Pine		
Lodgepole pine	627	
Hybrid pine	463	
Jack pine	229	
Limber pine	5	
Other pines	17	
		1,341
Spruce		
White spruce	56	
Engelmann spruce	21	
Black spruce	14	
Other spruces	32	
		123

Broad-leaved Trees	Collections	
Poplar		
Trembling aspen	120	
Balsam poplar	10	
Other poplars	13	
		143
Birch		
White birch	27	
Other birches	9	
		36
Alder		11
Willow		13
Total		203

Coniferous Trees	Collections	
Fir		
Alpine fir	23	
Balsam fir	3	
Other firs	2	
		28
Douglas fir		13
Juniper		2
Larch		
Eastern larch	5	
Western larch	8	
		13
Cedar		
Eastern white cedar	1	
Western red cedar	3	
		4
Other conifers		101
Total		1,625
Miscellaneous		24
Grand Total		1,852

IMPORTANT DISEASES

Atropellis Canker of Pine—This disease caused by *Atropellis piniphila* (Weir)Lohman and Cash, was reported from 10 new areas in 1960. These records extend the known distribution of this fungus north to within 60 miles of Grande Prairie. In addition the organism was noted for the first time on jack pine–lodgepole pine hybrids near Grande Prairie and Whitecourt.

Two new areas having a particularly high incidence of the disease were noted. Near Chungo Creek, north of Nordegg, two sample plots had 100 per cent of the trees infected with up to 61 stem cankers per tree and an average of 24 stem cankers per tree. Another area near the Clearwater Ranger Station had 90 per cent of the trees infected and an average of 13 stem cankers per tree.

Dwarf Mistletoe of Pine—Eighteen new locality records for this disease caused by *Arceuthobium americana* Nutt. ex Engelm., were reported in 1960. Its occurrence on spruce, first reported in 1952, was noted again in 1960, at Johnston Canyon in Banff National Park and in the Cypress Hills. In both cases the affected trees had been strongly suppressed by mistletoe-infected lodgepole pines. Five known areas of lodgepole pine mistletoe on spruce trees are now known.

Fifty-four previously known areas of infection on lodgepole pine were investigated to determine their extent and the intensity of infection. The survey showed that 61 per cent were heavily infected, and that 83 per cent of these were stands more than 80 years old. All the heavily infected stands less than 80 years had peculiar stand histories which explained the early development of heavy infection. The estimated area of these 54 stands is 43 square miles.

Two experimental flights were made to determine the effectiveness of aircraft in mistletoe surveys. In lodgepole pine stands approximately 80 years of age, witches' brooms were visible from 300–500 feet above ground. In stands over 100 years old the more severe brooming was visible from as high as 600–800 feet. In jack pine stands where brooms are more evident, infected areas were readily visible from heights of 800–1000 feet. During this last flight an infected area, approximately 65 miles long and 8 miles wide, was found between Big Point on Lake Athabasca and Firebag River. A smaller area was observed surrounding Winefred Lake, northeast of Lac la Biche. Aerial surveys appear suitable for the detection of heavily infected old stands or groups of trees, and thus aid materially in the planning of ground surveys.

Rusts—A heavy infection of gall rust, *Peridermium harknessii* J. P. Moore, was found in the Graburn Creek area of the Cypress Hills where up to 35 per cent of the trees were infected. Re-examination of the Sofa Mountain area in Waterton Lakes Park, where 100 per cent of the limber pines (*Pinus flexilis* James) were reported infected by *Cronartium ribicola* J. C. Fischer in 1958 and 1959, revealed rapid intensification of the disease. In the pure patches of *P. flexilis* the branch and leader mortality was as high as 75 per cent.

Needle rust of white and black spruce caused by *Chrysomyxa ledi* de Bary and *C. ledicola* Lagerh., was reported to be epidemic in five localities around Whitecourt and extending towards Lesser Slave Lake, Grande Prairie, Edson, and Rocky Mountain House. This disease was also epidemic in 1953 and 1955 in the same general areas.

Chrysomyxa pirolata Wint., the spruce cone rust, was common in eight localities. The highest observed incidence was near Rocky Mountain House where 7 per cent of the cones were infected.

Red Heartwood Stain of Pine—This disease is caused mainly by *Peniophora pseudo-pini* Weres. and Gibson, previously referred to as *Stereum pini* (Schleich. ex Fr.) Fr.) Sporophores were collected at widely separated localities from lodgepole pine, jack pine, and lodgepole pine–jack pine hybrids. The accompanying map shows that the fungus is widespread throughout the range of lodgepole pine and of hybrid pine. The collection at Ft. Wrigley, N.W.T., is noteworthy as our first record on jack pine and as a considerable northwest extension of the known range. The sporophores which occur mainly on dead branches were more abundant on trees between 50–100 years of age and on trees in moist, north-facing habitats.

Needle Cast of Lodgepole Pine—Occasional reports of the disease were made during the year, but the intensity had decreased from 1959. The known northern distribution of *Elytroderma deformans* (Weir) Darker was extended to immediately south of Grande Prairie. Collections of the other three fungi involved in this disease complex, *Hypodermella montana* Darker, *H. montivaga* (Petrak) Dearn., and *Lophodermium pinastri* (Schrad. ex Fr.) Chev., did not reveal new host or distribution records.

Leaf Spot and Ink Spot of Aspen—*Marssonina tremuloidis* (Ellis and Everh.) Kleb., caused a leaf spot of aspen foliage west of Lloydminster and at Banff.

Aspen ink spot, caused by *Sclerotium* sp. declined from the epidemic levels reported in 1959 in the Lac La Biche area. About 8 per cent of the foliage on 10 per cent of the trees was affected this year. The premature fall of affected foliage noted in previous years was not observed in 1960. The disease occurred east of Whitecourt and north of Turner Valley at endemic levels.

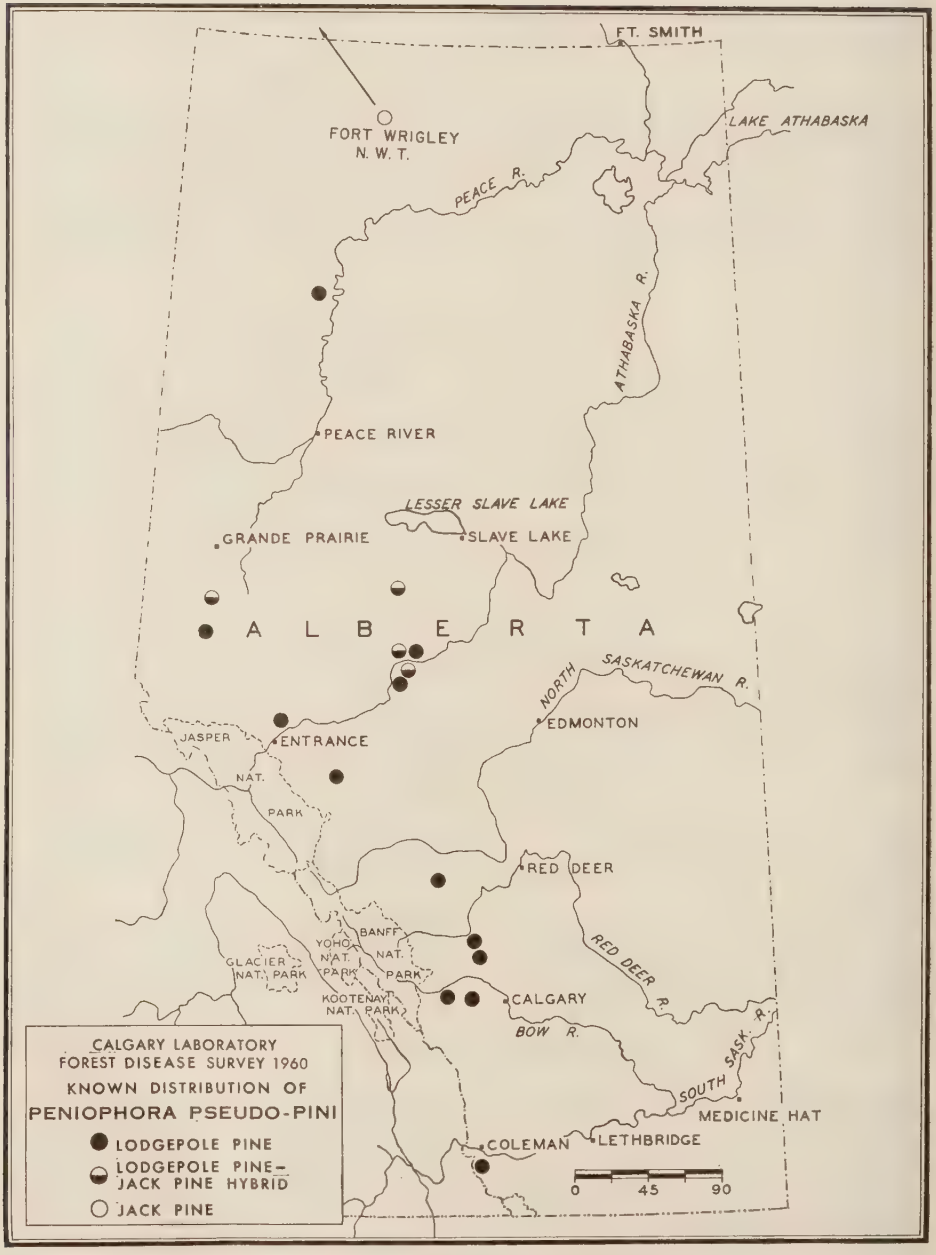
Unexplained Poor Condition of Pine—This condition of lodgepole pine occurs in the Whitecourt district and was first described in 1957. The affected area is now approximately 700 acres. In addition to sparse foliage and poor leader growth, some mortality has occurred. Spruce trees in the same area remained healthy. *Armillaria mellea* (Vahl ex Fr.) Quél. and *Atropellis piniphila* occurred on some dead trees, but this was not sufficient to explain the high mortality. The affected area was characterized by a high water table and a dense cover of acidophilous mosses (*Calliergonella schreberi* (Bry. Eur.) Grout, *Hylocomium splendens* (Hedw.) Bry. Eur., and *Ptilium crista-castrensis* (Hedw.) DN). An experimental area was marked for detailed study next field season.

Winter Injury to Conifers—'Red belt' or winter injury was absent from the mountains and foothills of Alberta in 1960. High mortality was observed in two localities where 'red belt' has been a frequent phenomenon. South of more Clearwater Ranger Station approximately 140 trees were killed on an exposed ridge, and along the Medicine Lake Road in Jasper National Park a 200-acre stand of pine and spruce was killed.

Drought—Drought symptoms on conifers were observed in the mountains and the foothills in late August and September. Douglas fir and spruce were most affected. The observed symptoms were yellow foliage, premature needle drop, and the death of small shaded branches. The most severe branch mortality occurred on gravel outwashes. Generally, however, about 10 per cent of the branches were affected. All age and size classes of trees were involved. Precipitation in the area during the period of April to July 1960 was approximately 8 inches less than in 1958 or 1959.

OTHER NOTEWORTHY DISEASES

Host	Organism	Locality	Remarks
Birch, white	*Taphrina nana* Johans.	Nordegg, Alta.	Causing witches' broom. First herbarium record.
Fir, balsam	*Pucciniastrum pustulatum* Kern	Whitemud River, Alta.	Needle rust. First herbarium record.
Fir, Douglas	*Phacidium infestans* Karst.	Yoho valley, B.C.	Snow mold. First herbarium record.
Juniper, mountain	*Gymnosporangium tubulatum* Kern	Radium, B.C.	First herbarium record.
Oak, red	*Taphrina caerulescens* (Desm. & Mont.) Tul.	Beaverlodge, Alta.	Oak leaf blister. First herbarium record.
Pine, hybrid, jack-lodgepole	*Elytroderma deformans* (Weir) Darker	Whitecourt, Alta.	Needle cast. First herbarium host record.
	Peridermium harknessii J. P. Moore	Whitecourt, Alta.	Gall rust. First herbarium host record.
Pine, jack	*Cronartium comandrae* Peck	Mile 300, McKenzie Highway, Alta.	Range extension far northward.
	Fomes pini (Thore) Lloyd	Fort Wrigley, N.W.T.	Range extension far northward on this host.
	Peridermium harknessii J. P. Moore	Davidson Lake, Alta.	Gall rust. Range extension far northward.
		Mile 18, Fort Providence Road, N.W.T.	Range extension far northward.
Pine, lodgepole	*Peridermium stalactiforme* Arth. & Kern	Mile 87, McKenzie Highway, Alta.	Stem rust. Range extension far northward.
Poplar, aspen	Clumping of aspen foliage	Rycroft, Alta.	Not as widespread in the foothills as in 1959.
Poplar, balsam	*Septoria musiva* Peck	Grovedale, Alta.	Leaf spot and canker. First herbarium record.
Serviceberry	*Gymnosporangium juvenescens* Kern	Banff, Alta.	Leaf rust. First herbarium record.
Spruce, black	*Fomes pini* (Thore) Lloyd	Norman Wells, N.W.T.	Range extension northward on this host.
Spruce, white	*Fomes pini* (Thore) Lloyd	60° 43' north, Liard River, N.W.T.	Range extension northward on this host.


FT. SMITH
FORT WRIGLEY
N. W. T.
LAKE ATHABASKA
PEACE R.
ATHABASKA R.
PEACE RIVER
LESSER SLAVE LAKE
GRANDE PRAIRIE
SLAVE LAKE
A L B E R T A
NORTH SASKATCHEWAN R.
EDMONTON
JASPER
NAT.
PARK
ENTRANCE
RED DEER
BANFF
NAT.
PARK
YOHO
NAT.
PARK
GLACIER
NAT. PARK
KOOTENAY
NAT. PARK
RED DEER R.
CALGARY
BOW R.
SOUTH SASK. R.
MEDICINE HAT
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LETHBRIDGE
0 45 90
CALGARY LABORATORY
FOREST DISEASE SURVEY 1960
KNOWN DISTRIBUTION OF
PENIOPHORA PSEUDO-PINI
LODGEPOLE PINE
LODGEPOLE PINE–
JACK PINE HYBRID
JACK PINE

PROVINCE OF BRITISH COLUMBIA

FOREST INSECT SURVEY

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Forest Biology Laboratory, Victoria and Vernon, B.C.

INTRODUCTION

The year 1960 was highlighted by an exceptional number of insect problems, particularly in the coastal region. The saddle-backed looper, which has never been considered a serious pest in coastal forests, severely defoliated 14,000 acres of hemlock at Kitimat and some tree mortality will undoubtedly result. The green-striped forest looper, another species which has not been regarded as a threat to hemlock stands, increased to outbreak proportions on the west coast of Vancouver Island; at least 37 spot infestations were recorded with severe defoliation occurring in several areas.

The black-headed budworm infestation in the Queen Charlotte Islands, which had increased to a high level in 1959, declined to light intensity in 1960. The decline was attributed to heavy larval mortality as a result of the cold, wet spring and early summer.

The two-year-cycle spruce budworm infestation in central British Columbia expanded greatly, encompassing over 7,600,000 acres in the Prince Rupert and Prince George districts. Top kill is now evident in localities where the infestation has been at a high level since 1954, and some tree mortality has occurred.

The known range of the balsam woolly aphid expanded in 1960 as a result of more intensive aerial and ground surveys. Tree mortality continued in all localities. Predator releases were started in 1960.

The large number of red-topped Douglas fir in the Interior indicated that the Douglas-fir beetle attacks in 1959 were much heavier than anticipated. It is believed that 1960 attacks were again numerous, but this cannot be verified until 1961.

Other insects which were more abundant than usual were the western hemlock looper, oak looper, and *Neodiprion* sawflies on conifers. Important new problems were an increase in terminal damage to Sitka spruce in the Queen Charlotte Islands, and to Douglas fir on Vancouver Island, the causes of which have not yet been clearly established.

Defoliating insects were unusually scarce in the Interior in 1960.

The Victoria Laboratory received 2,563 insect collections and the Vernon sub-laboratory 2,955 for a total of 5,518. Collections received during 1960 were distributed among the principal tree species as follows:

Coniferous Trees	Collections		Broad-leaved Trees	Collections	
Hemlock			Poplar		
Western hemlock	992		Trembling aspen	240	
Mountain hemlock	6		Black cottonwood	142	
		998	Silver poplar	1	
Douglas fir		879	Miscellaneous poplars	17	
Spruce					400
White spruce	329		Alder		
Sitka spruce	240		Red alder	78	
Englemann spruce	159		Mountain alder	43	
Black spruce	52		Sitka alder	19	
Miscellaneous spruce	21		Green alder	1	
		801	Miscellaneous alders	73	
					214

Coniferous Trees	Collections		Broad-leaved Trees	Collections	
Pine			Birch		
Lodgepole pine	409		White birch	59	
Ponderosa pine	144		Dwarf birch	32	
Western white pine	86		Water birch	19	
Miscellaneous pines	28		Western white birch	7	
		667	Miscellaneous birches	51	
					168
Fir					
Alpine fir	196				
Amabilis fir	94				
Grand fir	50				
Balsam fir	2				
		342			
Western red cedar		151	Garry oak		50
Larch			Cherry		41
Western larch	63		Willow		40
Tamarack	30		Maple		23
European larch	1		Dogwood		18
Miscellaneous larch	4		Broadleaf maple		12
		98	Arbutus		12
Juniper			Apple		4
Rocky mountain juniper	37		Hazlenut		2
Common juniper	12		Miscellaneous broad-leaved trees		18
Miscellaneous junipers	3		Total		1,002
		52			
Miscellaneous coniferous trees		15			
Total	4,003				

Miscellaneous hosts or no hosts specified 513

Grant Total 5,518

IMPORTANT INSECTS

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—The one-year-cycle spruce budworm outbreak in the Vancouver Forest District remained at a low level. No larvae or masses were found in the Lillooet River Valley where an infestation collapsed in 1959. Up to 14 larvae per three-tree beating sample were found at Hell's Gate in the Fraser Canyon, and up to 24 larvae per sample at Queen's Park, New Westminster, where larvae were present on Douglas fir, spruce, grand fir, western hemlock, and Norway spruce.

The spruce budworm population level increased at Kitimat where many balsam trees lost almost all their 1960 foliage and collections contained up to 100 larvae per sample. Defoliation extended from Kitimat north to Terrace. No egg masses were found in seven localities sampled, indicating a decrease for 1961.

A flight was made to check reports of an extensive spruce budworm infestation in the Telegraph Creek region, but poor weather hampered visibility. However, an infestation was observed in the Bob Quinn Lake–Ogilvie Creek area (of northern British Columbia) and defoliation extended over approximately 20 square miles. At the one locality ground-checked, 25 per cent of the buds were damaged. It is not certain if this is one- or two-year-cycle spruce budworm.

The one-year-cycle spruce budworm on Douglas fir was scarce in the Kamloops Forest District. A moderate infestation persisted along the Alaska Highway between Mileages 490 and 540.

The current two-year-cycle spruce budworm infestation is the most extensive recorded to date in central British Columbia. In the Prince Rupert Forest District light to heavy defoliation extended from west of the Bulkley River to Babine Lake, and from Taltapin Lake in the south to about 40 miles north of Nilkitkwa Lake. The outbreak expanded northward in the spruce alpine fir forests of the Prince George Forest District. Moderate to severe defoliation of the current year's growth extended from 30 miles north of the Nechako River

east from Babine watershed to the Rocky Mountains, along Finlay River to north of Fort Ware. South of Prince George a moderate infestation extended throughout the Willow River watershed to Wells. The area affected exceeds 7,600,000 acres.

The greatest damage was in the Babine Lake region where the infestation has been at a high level since 1954. Counts in May and June averaged 20 larvae per square foot of foliage surface, an increase of over 50 per cent compared with 1958. In many areas spruce and alpine fir lost 100 per cent of their 1960 foliage, and total defoliation averaged up to 80 per cent in some plots. Foliage examination in six plots showed about 85 per cent of the tips on spruce and alpine fir were killed. Top kill was prevalent on both tree species. Reproduction has been severely damaged; in some areas most of the spruce and alpine fir trees under six feet high were completely stripped and many are dead. The areas of heaviest damage are in the Nilkitkwa River Valley and between Chapman Lake and the Cronin Mine Road. Top kill is widespread and tree mortality has occurred in some areas, notably the Nilkitkwa River Valley.

The average number of egg masses per 100 square feet of foliage surface in 1960 was 144 on spruce, 105 on alpine fir, and 305 on lodgepole pine. The 1960 masses contained fewer eggs than in 1958. A comparison with some plots sampled in 1958 showed that egg mass numbers decreased an average of 82 per cent for spruce and 81 per cent for alpine fir. Comparative figures are not available for lodgepole pine but on the basis of total samples the number of egg masses per 18-inch branch sample decreased about 60 per cent compared with 1958. No defoliation of lodgepole pine occurred following the high egg counts of 1958 and it remains to be seen if the present egg population constitutes a hazard to lodgepole pine or if the larval population again fails to materialize.

The reduced egg counts may indicate a major decline in the outbreak in the Babine Lake area. However, in 9 of the 17 localities sampled the number of egg masses per 100 square feet of foliage surface exceeded 200, sufficient to result in extensive defoliation in 1961. Areas where high population levels are expected in 1961 are Hatchery Arm and Hagan Arm on Babine Lake, Taltapin Lake, Cronin Mine Road, and the Nilkitkwa River Valley.

The two-year-cycle spruce budworm persisted in low numbers in the subalpine forest of the Kamloops Forest District. Collections: Coast 141, Interior 143.

Black-headed Budworm, *Acleris variana* (Fern.)—The black-headed budworm infestation on the Queen Charlotte Islands decreased to a low level in 1960. The decline is attributed to the unusually cold, wet spring which adversely affected larval development. About 30,000 acres of valuable timberland in the Skidegate Inlet–Cumshewa Inlet area were sprayed with 1/4 pound of DDT per gallon per acre with good results.

A survey of the Queen Charlotte Islands during July indicated that larval numbers were decreasing significantly. The decrease was most conspicuous on Graham Island where samples averaged 21 larvae compared with 212 larvae per three-tree beating sample in 1959, a 10-fold decrease. The greatest numbers of larvae were found south of Cumshewa Inlet in the region from Louise Island to Ramsey Island. Here samples averaged 133 larvae each, a reduction of about 65 per cent compared with 1959. Light defoliation was observed on Ramsey, Lyell, Tanu, Talunkwan, and Louise islands.

Egg counts made at 23 localities south of Skidegate Inlet, which were sampled in 1959, averaged only 0.3 eggs per 10-inch tip. This decrease compares with the 9.7 eggs per 10-inch tip present in 1959. The greatest number of eggs, 4.2 per 10-inch tip, were found at Mosquito Lake. The outlook for 1961 is a very low population level and no defoliation.

The black-headed budworm was abundant on the coastal mainland section of the Prince Rupert Forest District from Lowe Inlet on Grenville Channel north to Observatory Inlet. Defoliation was noticeable at the head of Tuck Inlet and near the narrows where up to 270 larvae per sample were collected. The largest collection, 381 larvae, was made 2½ miles north of North Point in Observatory Inlet. Larvae were common in collections throughout the Vancouver Forest District, but the number of specimens per collection was small.

The black-headed budworm population level remained low throughout the Interior. Collections: Coast 197, Interior 10.

Saddle-backed Looper, *Ectropis crepuscularia* Schiff.—A severe outbreak of the saddle-backed looper occurred at Kitimat in 1960. No reports were received from this area in 1959, but a large moth flight occurred in May, 1960. The outbreak, 14,000 acres in extent, is confined to the west side of the Kitimat River and extends from 2 miles south of the smelter site to about 3 miles north of the railway station, and up the west slopes to about the 1,500 foot elevation which includes the Moore and Anderson Creek valleys. Defoliation was severe within the infestation area; nearly all coniferous and deciduous understory, including devil's club, was completely stripped. Many understory trees were completely defoliated and defoliation of the overstory hemlock was severe in several localities. Some tree mortality is expected at Sand Hill and in the Anderson and Moore Creek valleys.

About 1,800 acres were sprayed on August 1 with ½ pound of DDT per gallon per acre. From the standpoint of larval mortality the operation was not entirely satisfactory, but observations indicate that a considerable amount of foliage was saved.

Larval parasitism was light. The only parasite reared was *Dusona* sp. which emerges from the late-instar larvae and overwinters as a cocoon in the duff. A virus disease was also present, but did not become apparent in the field until most of the larvae were in the last instar.

In the Interior, a slight increase was detected along the North Thompson River, but there was no noticeable defoliation. Collections: Coast 103, Interior 48.

Green-striped Forest Looper, *Melanolophia imitata* Wlk.—The green-striped forest looper has never been regarded as a serious threat to western hemlock even when present in large numbers. However, in 1960 the looper increased to such a degree as to constitute a real problem. A total of 37 'spot' infestations ranging from 35 to 6,300 acres were detected on the west coast of Vancouver Island extending from Herbert Inlet to Nasparti Inlet. The total area involved was about 26,100 acres. The heaviest defoliation was on Villaverde Island where defoliation on individual hemlock trees ranged from 55 to 100 per cent, and averaged over 80 per cent.

Counts made in selected areas in October, 1960, showed that the number of overwintering pupae ranged from 0.5 to 2.1 per square foot of duff. The estimate for each area was based on 48 one-square foot samples. It is uncertain if this pupal population level represents a threat to the infested stands in 1961 as there is no basis for comparison.

The population level of the green-striped forest looper was higher than normal throughout the rest of Vancouver Island, but defoliation was light. The population level decreased on the mainland portion of the Vancouver Forest District.

This was the most numerous and widely collected looper in the Kamloops and Nelson Forest districts during July; however, it caused no appreciable defoliation. Collections: Coast 358, Interior 133.

Balsam Woolly Aphid, *Adelges piceae* (Ratz.)—The known range of the balsam woolly aphid in British Columbia increased in 1960. The infestation now includes the region between Indian Arm and Burrard Inlet, and the stands surrounding Howe Sound as far north as Madeira Park on the Sechelt Peninsula. Infested trees were found at Chapman Creek, McNair, McNab, Woodfibre, and Hill creeks. Possible gout was observed from the air in the Indian River Valley, and Cheekye River, and Mashita and Ring Creek valleys. No new infestations were found on Vancouver Island.

The attack appears to be mainly the 'gout' form as relatively few stem attacks were found except at Grouse Mountain and Mt. Seymour. Red-top trees were fewer than in 1959, but an aerial survey indicated a total of 5,300 trees to be dead, dying, or attacked. Tree mortality is particularly evident at Woodfibre Creek, Cypress Creek, and Seymour Mountain but is very light in other areas.

Ten species of native predators or suspected predators have been found in 1959 and 1960, some only in small numbers. The following species of introduced predators were released in 1960 at Seymour Mountain or Thetis Lake, Vancouver Island; *Laricobius erichsonii* Rosenh., *Aphidecta obliterata* L., *Scymnus pumilio* (Ws.), and *Pullus impexus* Muls.

Douglas-fir Beetle, *Dendroctonus pseudotsugae* Hopk.—The great number of Douglas-fir trees that had reddened by the late spring of 1960 clearly demonstrated that estimates of the 1959 infestations were often too conservative. New red-topped Douglas-fir trees were particularly numerous in the Cariboo where the beetle has expanded its depredations westward from Williams Lake across the Chilcotin District. The most spectacular increase occurred in the Cache Creek–Clinton region. Farther south, near Westwold, recent tree mortality at Ingram Creek was very noticeable. In the Narcosli Creek–Blackwater River area, Prince George District, and in the west portions of the Nelson Forest District, more red-tops were apparent than heretofore.

Although indications are that the Douglas-fir beetle remained abundant in 1960, this can not be confirmed until the attacked trees redden in 1961. Appraisals of commercial-sized Douglas-fir trees killed by *Dendroctonus* in 1957-1959 were made from vantage points on the ground and from aircraft in the late summer of 1960. Counts in areas of greatest attack were as follows: Aspen Grove to Princeton—200, Bear Creek—250, Ingram Creek—750, Westwold to Monte Creek—300, Tunkwa Lake to Highland Valley—400, and Narcosli Creek—1,000. The following comparative figures, with the 1959 counts in brackets, illustrate the increase in the number of red-topped trees: Cache Creek—4,280 (952), Riske Creek—1,540 (444), and Joes Lake—1,550 (338). The largest increase was at Joes Lake where a fivefold increase was recorded.

Approximately 10 per cent of the scorched Douglas-fir trees in a 400 acre burn adjacent to Myra Creek on Buttle Lake, Vancouver Island, were attacked by the Douglas-fir beetle. No attacks were observed in green trees.

Small groups of Douglas-fir trees have been attacked at Anderson Creek, the Skagit River Valley, and in the Lillooet River Valley.

Mountain Pine Beetle, *Dendroctonus monticolae* Hopk.—In 1960 the mountain pine beetle continued its depredations in lodgepole, white, and ponderosa pines in most of the areas infested in the preceding year. In the Nelson Forest District lodgepole pine trees killed in 1959 were observed, notably, at Coyote and Elk creeks, Boundary and Windfall creeks, Enterprise Creek, and along the upper Kettle River. A light infestation persists at Steamboat Mountain. Strip surveys in the Takla Lake pine belt, Prince George Forest District, showed that the beetles are still active but not epidemic there.

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White pine trees were attacked and killed in 1959 in the following localities: Dolly Varden Beach and Kingfisher Creek near Mabel Lake (157 trees), Scotch Creek north of Shuswap Lake (63 trees), and Malakwa (21 trees). Only 22 trees were attacked in 1959 between Blue River and Gosnell along the North Thompson River indicating a decline from previous years. There was also a slight decline along the Big Bend of Columbia River. Infestations in white pine persisted about upper Arrow Lake, particularly in the following localities: Arrowpark to Fosthall Creek, Akolkolex River, and from Nakusp to St. Leon Creek.

Very few ponderosa pines were attacked. A small number of trees were infested near Long Lake, southeast of Westwold, and at Alleyne Lake.

Scots pine trees near Pritchard were killed by the mountain pine beetle, presumably the first such occurrence in British Columbia. Four of 10 trees, (6) to (8) inches D.B.H. attacked in 1959 had died by June 1960.

Considerable white pine mortality has occurred over a 10-square-mile area in Manning Park. Heavy white pine mortality was also observed in the Squamish River Valley, on the Sechelt Peninsula, and throughout Vancouver Island.

Engelmann Spruce Beetle, *Dendroctonus engelmanni* Hopk.—The Engelmann spruce beetle persisted at a low population level in southern British Columbia.

Alaska Spruce Beetle, *Dendroctonus borealis* Hopk.—Personnel of the British Columbia Forest Service sprayed 55,000 cubic feet and peeled 75 per cent of the surface of an additional 194,000 cubic feet of beetle-infested white spruce logs near Hay Lake in the central Interior. The spray consisted of a diesel oil emulsion of ethylene dibromide applied early in June. Peeling was done between May 26 and June 27. The treatments eliminated the hazard presented by the large number of bark beetles in the logs.

A Spruce Beetle, *Dendroctonus* sp.—About 500 acres of white spruce trees adjacent to an old burn in the Bob Quinn Lake–Ogilvie Creek area in northern British Columbia were heavily attacked by an unknown species of bark beetle. Spruce up to 36 inches D.B.H. contained beetles and the outbreak appears to be continuing. Other apparently infested spruce stands were observed from the air in this northern region.

Western Pine Beetle, *Dendroctonus brevicomis* Lec.—In 1960 a few small groups of mature ponderosa pine trees were killed by the western pine beetle in the Kamloops Forest District near Penticton, between Princeton and Aspen Grove, and at Alleyne Lake.

Lodgepole Pine Beetle, *Dendroctonus murrayanae* Hopk.—This species was observed in the root collar of lodgepole pine trees in the Yukon Territory. Scattered patches of dead trees infested by *D. murrayanae* occurred along Annie Lake Road, near Whitehorse.

Red Turpentine Beetle, *Dendroctonus valens* Hopk.—One dead and two living 10-inch d.b.h. Scots pines near Westwold were infected by the red turpentine beetle. The dead tree apparently has been infested for the past two or three years.

Larch Bark Beetle, *Dendroctonus simplex* Lec.—The larch bark beetle infested two of three flood-damaged eastern larch trees south of Fort Nelson. On July 15 these trees contained parent adults and larvae; on August 19 pupae and callow adults were present. On June 1 and 29 a fallen tree near Wildmare Creek was infested with numerous parent beetles and larvae. These constitute the first record of *D. simplex* in British Columbia.

Ambrosia Beetles, *Trypodendron lineatum* (Oliv.), *Platypus wilsoni* Sw., and *Gnathotrichus* spp.—*Trypodendron* again occurred in large numbers around logging operations on the Coast and on the Queen Charlotte Islands. The spring attacks at Lake Cowichan, Vancouver Island, occurred over a rather prolonged period from April 7 to June 8, probably due to the wet, cold weather of April and May. All the boomed logs on Lake Cowichan and many logs in other coastal regions were sprayed by helicopter during April to prevent damage. *Gnathotrichus* was common in the areas observed, but not as numerous as *Trypodendron.*

Platypus wilsoni, which is normally rather scarce, was numerous in a group of dead and dying amabilis fir in Copper Canyon, Vancouver Island.

In the Interior, *Trypodendron* severely infested unpeeled cedar poles near Graham Landing and Sugar Lake. Sprays applied after attack helped to reduce the amount of damage. Light ambrosia beetle infestations occurred in spruce logs at Jamieson Creek and Sock Lake.

Oregon Pine Engraver, *Ips oregoni* (Eichh.)—This species of *Ips* was abundant in tops and limbs of ponderosa pines logged in the late winter of 1959 and spring of 1960 near Okanagan Landing, and on the Salmon River Indian Reserve. A small group of ponderosa pine trees was killed by *I. oregoni* two miles south of O'Keefe. *Ips emarginatus* Lec. was frequently found with *I. oregoni.*

Since 1955, over 200 mature ponderosa pine trees have been killed by *Ips* beetles in combination with *Dendroctonus brevicomis* and *D. valens* in the Little Shuswap Lake area.

Oregon Fir Sawyer, *Monochamus oregonensis* Lec.—Although much timber was killed by forest fires in the Interior during 1960, relatively few standing burnt Douglas fir and spruce trees were infested by *Monochamus.* Most of the fires occurred after mid-July when the major flight of *M. oregonensis* was over. Spruce trees killed early in the summer of 1958 in the Lin and Fir fires, Prince George area, were heavily attacked. Of the total sawyer beetle emergence to September 1960, 51 per cent emerged in 1959, and 49 per cent in 1960.

Douglas fir, larch, and spruce trees at Gold Creek, St. Mary's Lake, and Galbraith Creek killed by fire in mid-July 1960 were examined for borer damage in mid-September. With one exception (one *Monochamus* larva) the *Monochamus* and buprestid larvae were still feeding in the cambium and had not begun to bore into the sapwood.

A Pine Sawyer, *Monochamus* sp.—Near Vernon, moderate to severe infestations of *Monochamus* were observed in ponderosa pine stands killed by fires started July 7, 1960. Most of the larvae were well into the wood by mid-October.

Pine Butterfly, *Neophasia menapia* Feld.—In 1959 a spectacular pine butterfly flight occurred at Cathedral Grove (MacMillan Park) on Vancouver Island. Counts made in November, 1959, averages 7.4 eggs per square foot of foliage surface. Defoliation was light in 1960, averaging about 20 per cent, but nearly all the 1959 foliage was lost and there was some back feeding on the 1958 foliage. Very little feeding occurred on the current year's growth where the eggs are laid.

An even heavier butterfly flight occurred in 1960, and the number of eggs in the same locality increased about $2\frac{1}{2}$ times. The infested area is reserved as a showplace and a tourist attraction with some over-mature Douglas fir and balsam up to 10 feet in diameter and over 200 feet high. Because of the aesthetic value of the stand, chemical control may be applied in 1961.

The number of eggs was low in the Cameron River Valley and at Dunsmuir Creek, Nanaimo Lakes, but the population trend was upward. Collections: Coast 11, Interior 2.

Western Hemlock Looper, *Lambdina fiscellaria lugubrosa* (Hlst.)—The population level of this species remained above average in the coastal forests. The largest number of larvae collected was at Dahlstrom Point in Holberg Inlet, Vancouver Island, where 52 larvae per sample were taken from western hemlock and 51 larvae from spruce. Defoliation was light and only a few eggs were found in November. Larvae were abundant at Powers River, Vancouver Island, in association with *Melanolophia imitata*. Egg counts averaged only 2.1 per $\frac{1}{2}$ square foot of bark surface, considerably below the 10 calculated to represent a hazard.

Larvae were common throughout much of the Vancouver Forest District and the South Prince Rupert District, but the number of larvae per collection was small. The population at Stanley Park, Vancouver, which was sprayed in 1959, was low.

The hemlock looper in the Interior increased along the Big Bend Highway and North Thompson River, although it did not cause noticeable defoliation. A decline was detected in the Quesnel Lake area. Collections: Coast 78, Interior 55.

Oak Looper, *Lambdina somniaria* (Hlst.)—Garry oak trees were severely defoliated in a localized area in Victoria bounded by Douglas Street, Rogers Avenue, Quadra Street, and McKenzie Avenue. Nearly all oaks on Christmas Hill were completely defoliated. Feeding also occurred on coniferous trees with defoliation of grand fir up to 90 per cent and Douglas fir up to 80 per cent. Some coniferous trees were sprayed by home owners to prevent mortality.

Parasitism was very light, but a virus disease caused considerable mortality in 1960. Collections: Coast 10.

Poplar and Willow Borer, *Sternochetus lapathi* (L).—Attacks continued in the mainland portion of the Vancouver Forest District as far north as Madeira Park on the Sechelt Peninsula. Willow, the preferred host, has been attacked from sea level to 3,000 feet. The heaviest damage observed was at Chapman Creek.

This borer is a ubiquitous pest in the southern Interior. Among the larger infestations in willow are those at Larkin (about four acres) and between Falkland and Westwold where the infestation borders the Salmon River for about five miles.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—A forest tent caterpillar epidemic is apparently developing in the Interior. Trembling aspen trees at three centres near Golden suffered up to 50 per cent defoliation. Severe defoliation is also predicted for 1961 especially between Nicholson and Donald where up to 357 egg masses per tree were recorded.

Defoliation ranged up to 60 per cent in the McBride infestation. Egg sampling indicated that defoliation will be heavy in 1961.

Forest tent caterpillars caused severe defoliation between Hazelton and Kitwanga in the Skeena River Valley. Most aspen and other deciduous trees and bushes were almost completely defoliated. At one time so many larvae were crossing the highway at Skeena Crossing that driving conditions were reported as "slippery". Up to 160 egg masses were recorded per tree, indicating heavy defoliation can be expected in 1961. Collections: Coast 14, Interior 2.

Western Tent Caterpillar, *Malacosoma pluviale* (Dyar)—The population on the Saanich Peninsula increased in 1960, but there was no noticeable defoliation. The heavy infestation at Terrace has collapsed as only a few colonies were observed. Heavy defoliation occurred in the Ladner–Delta–Fraser Valley region in association with the forest tent caterpillar.

Population levels in the Interior remained low in 1960. Collections: Coast 18, Interior 16.

Silver-spotted Tiger Moth, *Halisidota argentata* Pack.—Webs of the silver-spotted tiger moth were again numerous on the southwestern portion of Vancouver Island, the Straits Islands, and on the mainland from Vancouver to Powell River. There was no severe defoliation in 1960. The population level, although relatively high, was below that of 1954. Overwintering colonies were very conspicuous in early November. The population level will probably be higher than normal in 1961. Collections: Coast 47.

Cooley Spruce Gall Aphid, *Adelges cooleyi* (Gill.)—This insect was at a high population level on Douglas fir reproduction in many localities in Coastal British Columbia. Heavy infestations on spruce were reported in the Nusatsum Valley, Bella Coola, and the south end of Babine Lake. The occurrence of *Adelges cooleyi* on the Queen Charlotte Islands has caused considerable concern because of the valuable spruce stands. Douglas fir, the alternate host, is not indigenous to the Islands. A few planted Douglas fir still remain on Maude Island. Further planting of Douglas fir will be discouraged.

There was an obvious decline in aphid numbers on Douglas fir and spruce throughout the Interior, but newly formed galls were common on spruce.

Other Woolly Aphids on Conifers, *Adelges* spp.—One or two hemlock shade trees were heavily infested by *A. tsugae* Annand in Revelstoke and Sicamous. A few mature hemlock trees along Goat River, 2 miles west of Kitchener, were lightly infested by this insect. Woolly aphids were common on western hemlock in Bella Coola and about 6 miles up the Bella Coola Valley.

A moderately severe outbreak of *A. oregonensis* Annand was noted on western larch reproduction in the lower valley of Hallmark Creek, Creston Ranger District.

Woolly aphids were numerous on lodgepole pine reproduction over $1\frac{1}{2}$ acres near Three Brothers Game Reserve. Needles on infested tips were discoloured and dropped when touched.

It is believed that a new species of *Adelges* has been found on amabilis fir at Kitimat.

Satin Moth, *Stilpnotia salicis* (L.)—There was a further reduction in satin moth numbers in the Okanagan Valley in 1960; only a few trees or small groves of trees were moderately to severely defoliated. Near Kamloops only three groves of aspen were defoliated; south of the city several groves near Stump Lake were denuded. Collections: Coast 0, Interior 2.

Conifer Sawflies, *Neodiprion* spp.—Excepting the species on hemlock, *Neodiprion* sawflies on conifers were generally scarce during 1960. The hemlock sawfly was numerous near Cherryville, Sugar Lake, and Kingfisher Creek in the Kamloops District, along the Big Bend Highway, and at one point on Haines Road. Defoliation was very light.

Neodiprion sawflies were numerous throughout the Vancouver Forest District and the South Prince Rupert District. Defoliation was observed on

amabilis fir in a localized area near Comox Lake and Eric Creek. Sawflies defoliated nearly all the 1959 foliage on the upper crowns of most lodgepole pine in an area of over 600 acres at the north end of Chilliwack Lake. The damage should not be serious unless the infestation continues in 1961.

Neodiprion sawflies caused light to medium defoliation of mature and overmature hemlock between Burnett and Angus creeks. The heaviest feeding was confined to an area less than 1 mile in extent. Up to 1,170 larvae per three-tree beating sample were collected in this area. This is the heaviest outbreak of this insect encountered for several years. Collections: Coast 433, Interior 306.

Fir Engraver, *Scolytus ventralis* Lec.—Dead and dying grand fir trees were common on Vancouver Island from Sooke to Courtenay on the east coast, and on the west coast between Nitinat Lake and Port Alberni. The heaviest mortality occurred in the Chemainus River Valley where about 400,000 bd. ft. of grand fir were salvaged, about half of which had been killed by this beetle. A large number of grand fir trees in the Saanich Peninsula died in 1960. Trees from 6 inches D.B.H. and up are attacked.

Examination of dead trees show that this beetle has been present throughout the infested area for some years. Attacks on individual trees are localized in that galleries are usually restricted to an area up to 4 feet long and seldom more than half the circumference of the bole. Trees may be attacked up to five or more successive years before being girdled.

Western Cedar Bark Beetle, *Phloeosinus punctatus* Lec.—No new attacks were found in 1960. Buprestids attacked several cedar trees at Silverdale which were apparently dying as a result of last year's attack; the trees are now dead. Scattered dead trees and considerable top killing were observed on all the Gulf Islands with the heaviest damage being done on Galiano, Mayne, and Salt Spring islands.

Aspen Leaf Miner, *Phyllocnistis populiella* Cham.—The aspen leaf miner remained abundant throughout most of the Interior and into the Yukon Territory. A noticeable increase occurred in the Cariboo; a decrease was observed in most of the Kamloops Forest District south and east of the Cariboo, and in the Liard River Valley, Prince George Forest District. Numbers increased slightly in the eastern part of the Nelson Forest District.

Serpentine Miners, *Phyllocnistis* spp.—A leaf miner of this genus was abundant on black cottonwood trees in several widely scattered localities: Edgewood and Revelstoke, B.C., and at Watson Lake and Rancheria River in the Yukon Territory.

A *Phyllocnistis* sp. in willow foliage increased slightly in abundance in the Liard River Valley, between Smith and Coal Rivers.

Fall Webworm, *Hyphantria cunea* (Drury)—The fall webworm was numerous in the southern part of the Kamloops Forest District; elsewhere in the Interior it was, at most, only in light infestation proportions. There was an increase in the number of tents in Spences Bridge area, and the North Okanagan. In the latter area tents were larger than in 1958 and 1959. The population in the Rocky Mountain Trench of Nelson Forest District declined to a low level.

The fall webworm was common between Oyster River and Courtenay on Vancouver Island. A threefold increase was recorded by roadside counts at Chilliwack and Cultus Lake, and Pirdonville on the mainland. Webs were also common on all deciduous trees on the Sechelt Peninsula. Collections: Coast 4, Interior 5.

Sitka Spruce Weevil, *Pissodes sitchensis* Hopk.—This weevil continued to attack Sitka spruce regeneration throughout the coastal region in 1960 particularly in the Nitinat River Valley. Although attacks are usually restricted to trees under 50 feet high a considerable number of trees in the West Prince Rupert District over this height have been attacked. A height record was established when the terminal on a 100 foot spruce tree was attacked and killed. There are no records of this weevil from the Queen Charlotte Islands.

Root Collar Weevils, *Pissodes* spp.—*Pissodes costatus* Mann. killed a number of white pine seedlings in the Arrow Lakes Valley and at Kaslo. *P. schwarzi* Hopk. infested and killed four or five blue spruce, *Picea pungens* Eng., seedlings in a nursery at Creston.

Alder Flea Beetle, *Altica ambiens* (Lec.)—Localized but severe defoliation of alder by flea beetles was observed north of Vernon near Larkin, at the mouth of Salmon River, and on the west side of Kalamalka Lake. Moderate defoliation was noted along Simna Creek.

Rusty Tussock Moth, *Orgyia antiqua badia* (Hy. Ed.)—The rusty tussock moth has been found in small numbers in the Quatsino Sound–Holberg Inlet region of northern Vancouver Island since 1956. In 1960 an increase was evident, and a small spot infestation was detected on the southwest side of the panhandle of Drake Island in Quatsino Sound. Up to 133 larvae per three-tree beating sample were collected. Western hemlock is the preferred host but larvae were collected from Douglas fir and Sitka spruce. Collections: Coast 40.

Pine Needle Scale, *Phenacaspis pinifoliae* (Fitch)—Light infestatations of pine needle scale persisted on ponderosa pine in most parts of South Okanagan. A few small groups of trees near Kaleden and Summerland were severely infested: parasitism and predation in these areas was heavy.

The numbers of scales on ponderosa pine for 3 miles along the Mamette Lake road north of Nicola increased considerably.

Black Pine-leaf Scale, *Nuculaspis californica* (Col.)—The black pine-leaf scale population level on pondorosa pine continued to decline at Campbell Mountain and Penticton. Scattered lightly infested trees were observed east of Naramata. The light infestation in Botanie Valley also decreased.

A new locality record for this pest was obtained with the discovery of a few severely infested trees at Kushkanook on the shore of Kootenay Lake.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlk.)—Light to severe infestations recurred along the Yukon section of the Alaska Highway. Defoliation at Mile 1205 increased in severity.

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—Larch sawfly numbers on tamarack again increased slightly in the Peace River district. No larvae were collected on western larch in southern British Columbia.

Willow Leaf Blotch Miner, *Lyonetia saliciella* Busck—Moderate to severe foliage damage by this blotch miner was again widespread in the Nelson Forest District. The most severe damage by *Lyonetia* sp. occurred on birch about Trout Lake, Nelson Forest District.

Douglas-fir Needle Miners, *Contarinia* spp.—Light infestations persisted throughout much of the range of Douglas fir. Recent studies at Vernon by S. F. Condrashoff have shown that three species of *Contarinia* attack needles of current growth.

Sequoia Pitch Moth, *Vespamina sequoiae* (Hy. Edw.)—Lodgepole pines in the Cheakamus River Valley north of Cheekye in the South Vancouver District were heavily infested with the pitch moth. Young trees averaging about 5 inches D.B.H. had been attacked from one to six times. Some trees are deformed and others nearly girdled.

Alder Sawfly, *Hemichroa crocea* (Fourc.)—A small infestation of the alder sawfly occurred at Mile 10 on the Alice Lake Logging road in the Sechelt Peninsula. Light defoliation was observed near Westview. Defoliation also occurred in the University of British Columbia Forest at Haney, and from Coquitlam Lake to Bedwell Bay. Collections: Coast 18, Interior 4.

European Pine Shoot Moth, *Rhyacionia buoliana* (Schiff.)—Pines at 22 nurseries and other points across southern British Columbia from Victoria to Creston were carefully examined in 1960 but the European pine shoot moth was found only in Greater Vancouver. Although Mugho and Austrian pines in two Vancouver nurseries were infested in 1959 a control program appears to have been successful.

Green Velvet Looper, *Epirrita autumnata* (Con.)—Larvae of this looper were common throughout the Vancouver and Prince Rupert Forest districts in 1960. No collections exceeded 25 larvae per three-tree beating sample. Collections: Coast 113, Interior 18.

Spruce Tip Moth, *Zeiraphera diniana* Gn.—Feeding by the spruce tip moth was conspicuous in several coastal areas in 1960. Twenty-five per cent of the spruce buds in the Zeballos River Valley, and 20 per cent in the Tahsis Inlet area, Vancouver Island, were infested. Some buds contained up to three larvae. Between 50 and 75 per cent of the buds on young amabilis fir at Granite Lake in the North Vancouver District were damaged by larval feeding. Feeding was also noticeable on Sitka spruce on Malcolm Island. Collections: Coast 29, Interior 5.

Sitka Spruce Terminal Damage—In the Queen Charlotte Islands sitka spruce reproduction up to 30 feet in height is being severely damaged. The terminal bud is killed before growth starts in the spring, resulting in multiple leaders and forked stems. An average of 40 per cent of the trees tallied on four plots between Cumshewa Inlet and Skidegate Inlet were affected. There was evidence of insect damage in some dead buds and a fungus, *Cephalosporium* sp., was isolated from others. The cause of death of many buds was not apparent.

Douglas-fir Terminal Damage—A large proportion of the terminals on second growth Douglas fir trees on southern Vancouver Island are being killed or broken. Some of this damage is the result of mining by *Dioryctria* sp., but many terminals show no evidence of insect attack.

Twig-infesting Cecidomyiids, *Cecidomyia* spp.—The midges that recently caused severe 'flagging' of ponderosa pine twigs decreased in abundance in the East Nelson district; a less pronounced decline occurred in other portions of the Nelson District and in the Kamloops Forest District.

The species infesting lodgepole pine twigs and candles were particularly abundant in the Beaverdell Ranger District.

Spruce Seedworm, *Laspeyresia youngana* Kft.—The spruce cone crop was generally light in British Columbia and Yukon Territory and the spruce seedworm was present in most collections sampled. It was most numerous in Yukon where 26 to 96 per cent of the samples contained *Laspeyresia.*

A Weevil in Western Red Cedar, *Hexarthrum* sp.—For the second successive year weevils, *Hexarthrum* sp., were collected in small numbers at several mills along the Big Bend Highway. *Hexarthrum* bores deep, narrow-diameter tunnels in overmature cedar trees rendering the wood unsatisfactory for shingles.

The Prominents, Notodontidae—Some members of this family of broad-leaved tree defoliators were more numerous than usual. *Schizura concinna* (S. & A.) colonies were frequent along roadsides in the wetter portions of the Kamloops and Nelson forest districts. *Datana ministra* (Drury) was common throughout the lower elevations of Okanagan Valley.

Leaf Rollers on Aspen, *Pseudexentera improbana oregonana* Wlshm.—This was the most abundant of several leaf rollers found on trembling aspen in the Interior. Defoliation was most evident in the Rocky Mountain Trench.

Leaf Eating Beetles, *Chrysomelidae— Chrysomela scripta* Fab. denuded a grove of Carolina poplar saplings near Winfield. *Chrysomela semota* Brown severely defoliated a patch of black cottonwood seedlings near Trutch on the Alaska Highway.

Light to moderate defoliation of willows for about seven miles along Bonanza Creek was attributed to feeding by *Gonioctena* sp.

Spruce Spider Mite, *Oligonychus ununguis* (Jac.)—The spruce spider mite severely infested several young Engelmann spruce trees in Vernon. The trees had been transplanted from the forest to very dry sites.

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Erannis vancouverensis Hlst.....	Garry oak, maple, birch, alder	Adams Lake Victoria	Localized infestations collapsed in 1960.
Hylobius spp.....	White pine	Between Nakusp and Galena Bay	Damaged many roadside seedlings.
Orgyia pseudotsugata (McD.)....	Douglas fir	Kamloops Forest District	Low population levels persist.
Scolytus spp.....	Grand fir	Blewett, and Creston Ranger District	Caused scattered mortality to pole-sized trees.
Lithocolletis sp.....	Trembling aspen	Liard River Valley	Infestation increased in area.
Archips cerasivoranus (Fitch)	Cherry	Interior B.C	Declined to a low population level.
Coleophora laricella (Hbn.).....	Larch	Southern Interior	Present in northern Idaho but not detected in B.C.
Nepytia sp.....	Douglas fir	Nelson Forest District	The false hemlock looper remained at a low population level.
Operophtera bruceata (Hlst.).....	Trembling aspen, willow	Northern B.C.	Infestations collapsed in 1960.

PROVINCE OF BRITISH COLUMBIA

FOREST DISEASE SURVEY

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INTRODUCTION

Weather conditions in British Columbia were generally moderate during 1960 and reports of weather damage to trees were uncommon. Foliage diseases, however, flourished and three reached epidemic proportions: Douglas fir needle blight, yellow pine needle blight, and larch needle cast. Foliage rusts were common and a limited outbreak of ink spot of aspen was reported for the first time in several years.

Of special note in 1960 was the detection of two apparently introduced rusts, one on yellow pine seedlings, and the other on cultivated juniper and pears. Willow blight was detected in the Province for the first time since 1941.

The 2,049 collections submitted in 1960 are listed below, according to host:

Coniferous Trees	Collections	
Douglas fir		820
Fir		
Alpine fir	258	
Grand fir	19	
Amabilis fir	18	
		295
Hemlock, western		267
Pine		
Lodgepole pine	97	
Western white pine	20	
Scots pine	10	
Ponderosa pine	9	
Red pine	2	
Other pines	11	
		149
Spruce		
Sitka spruce	37	
White spruce	27	
Engelmann spruce	12	
Black spruce	9	
Other spruces	1	
		86
Juniper		
Rocky Mountain	10	
Common juniper	6	
Other junipers	12	
		28
Larch		
European larch	7	
Western larch	4	
Other larches	4	
		15
Cedar, western red		13
Yew, western		5
Total		1,678

Broad-leaved Trees	Collections	
Alder		
Red alder	42	
Sitka alder	6	
Mountain alder	2	
		50
Maple		
Douglas maple	6	
Broadleaf maple	5	
Vine maple	1	
Other maples	3	
		15
Birch		
Western white birch	4	
Other birches	9	
		13
Oak		
Garry oak	4	
Other oaks	2	
		6
Willow		55
Aspen, trembling		24
Cottonwood, black		24
Cherry		5
Arbutus		3
Total		195

Miscellaneous or host not specified 176

Grand Total 2,049

Weather Injury—Moderate weather conditions prevailed during 1960 in British Columbia and only two reports of frost damage were received. Alpine firs over about 100 acres on Tabor Mtn., in the Prince George Region, suffered light frost damage, while lodgepole pines over several hundred acres near Bennett, in northeastern British Columbia, suffered more severe damage. The latter report described severe dieback symptoms probably resulting from repeated injury.

The residual effects of the 1958 drought continued to cause mortality and dieback. Douglas fir, one of the tree species most severely damaged by the direct effects of the drought, continued to show progressive dieback and mortality losses in the Lillooet and Pavilion areas and new dieback was reported in the lower Fraser Valley. *Cytospora* sp., found associated with the dieback in 1959, was present on most samples submitted. *Armillaria mellea* (Vahl ex Fr.) Quél. was frequently associated with mortality of Douglas fir as well as other species. Reports of alder dieback and mortality from several regions of the Province including Terrace, Lower Fraser Valley, and Vancouver Island, also suggested drought injury. Some undetermined insect mining and fructifications of *Nectria* sp. were associated with much of the damage.

Foliage Diseases—Weather conditions in 1960 apparently favoured the development of foliage diseases in many parts of the Province. A very high level of infection was recorded for several fungi and many others, while not particularly damaging, were more common than usual.

Elytroderma deformans (Weir) Darker continued to intensify in yellow pine stands for the third consecutive year and mortality in the suppressed crown classes was noted on several permanent plots. Killing of lower branches on large mature trees was general in areas of very severe infection.

Hypodermella laricis Tub., which causes an important needle cast of western larch, attained epidemic levels in the Rock Creek, West Kettle and Upper Kettle areas and along the east side of Upper Arrow Lake. The severe infections common in the Creston area in past years were not present.

Rhabdocline pseudotsugae Syd. continued at epidemic levels in Canal Flats–Invermere Douglas fir Christmas tree holding. Heavy infection of individual trees was reported from other areas, particularly on the coast, but on the whole, damage was negligible.

Foliage rusts were more common and generally at higher than average infection levels.

Ink spot disease of trembling aspen caused by *Ciborinia whetzelii* (Seav.) Seav. reached outbreak proportions at Euchu Lake in Tweedsmuir Park and at Tabor Creek near Prince George after being virtually absent for several years.

Melampsora pinitorqua*(?) *in North America—A rust of ponderosa pine seedlings has been noted in a small experimental seedbed at the forest tree nursery of Telkwa. The fructifications of the rust fungus causing this disease indicate that it is a species of *Melampsora*, and a preliminary review of the literature shows that the only *Melampsora* rust of pine known is *M. pinitorqua* Rostr., the pine twist rust of Europe.

Further observations and studies are required to establish whether this is the first introduction of the pine twist rust fungus into North America or is a new species.

Introduction of Pear–Juniper Rust from Europe—For several years a rust has caused considerable damage to pear trees near Victoria. Only recently has it been determined that this rust is not *Gymnosporangium clavariiforme* (Pers.) DC., the native pear rust, but is *Gymnosporangium fuscum* DC., the European pear rust. Infections have been recorded in the same area on the alternate host, *Juniperus sabina* L., an introduced ornamental. This is believed to be the first instance where *G. fuscum* has been established outside of Europe and on a perennial basis on both alternate hosts.

Willow Blight—Willow blight was reported in British Columbia for the first time at Abbotsford in 1941 (Conners, I. L., McCallum, A. W., and Bier, J. E. 1941. Willow blight in British Columbia. Phytopathology, 31: 1056–1058). There have been no further records until the present infection was found at the University of British Columbia Arboretum. The damage was first observed in the summer of 1958 on *Salix* 'June des Ardennes' and has since spread to *Salix amygdalina* L. v. *fragilis*, *S. alba* L. v. *vitellina*, and *S.* x *fructicosa* Doell. Several native willows, including *S. sitchensis*, standing nearby have not shown any symptoms to date (Bloomberg, W. J. and Funk, A. 1960. Willow blight in British Columbia. Can. Dept. Agr., For. Biol. Div., Bi-monthly Prog. Rept., 16 (5): 3.).

The symptoms characterizing the disease are a blackening of the entire blade of the youngest leaves, followed by a black lesion which encircles and progresses down the shoot, eventually killing the whole branch. In some of the infected trees up to one third of the crown has been destroyed. Suckers emerging from the base of *S. alba* v. *vitellina* have also been blighted.

The causal fungus, *Fusicladium saliciperdum* (All. & Tub.) Tub. has been found on the leaves and small twigs. *Physalospora miyabeana* Fuk., which commonly accompanies or follows *Fusicladium*, has not been observed in the present outbreak in either of the spore states. *Cytospora* sp. occurred abundantly on dead overwintered twigs but it was considered to be strictly saprophytic on the material killed by *Fusicladium*.

Dying of Weeping Willow—During June and July, 1960, a large number of ornamental weeping willows throughout the central part of the Kamloops Forest District exhibited severe crown symptoms and some appeared to be dead or dying. The symptoms started with yellowing and thinning of the foliage on part or all of the crown. Closer examination revealed longitudinal cracks in the bark and large lesions partly or completely girdling the affected branches or trunk. The long, orange, spore-tendrils of *Cytospora* sp., probably *Cytospora chysosperma* (Pers.) Fr., were commonly found on the diseased bark.

Of 1,400 trees examined throughout Kamloops, Savona, Cache Creek, Ashcroft, Lytton, and Merritt, 44 per cent were affected and 8 per cent had lost more than one half of the crown or died. The damage was apparently confined to the Babylon weeping willow, *Salix babylonica* L. Wisconsin weeping willow, *Salix blanda* Anders, which is nearly as common, seemed to be resistant.

No virulent organism was detected and the cause of the damage, therefore, could not be determined with certainty. It is probable that trees weakened by adverse environment became susceptible to infection by the relatively weak parasite *Cytospora* sp. The wide distribution of damage suggested that predisposition was probably the result of adverse weather conditions rather than local site factors. A severe frost, recorded during early November, 1959, may have been implicated.

Melampsora Rust of Douglas Fir and Poplar—The incidence of leaf rust (*Melampsora occidentalis* Jacks.) on wild and cultivated black cottonwood at a nursery near Terrace was reduced drastically by removing all Douglas fir

seedlings from the nursery beds. The rust had in the past caused serious damage to the Douglas fir as well as the cottonwood. Several varieties of hybrid poplars, such as *Populus* X *canadensis* 'Grandis', *P.* X *canadensis* 'Robusta Bachelieri', *P.* X *canadensis* 'Serotina', *P.* X *Generosa* Henry, and others. appeared to be immune to the rust.

The nursery is located approximately 50 miles north of the natural range of Douglas fir.

Diseases of Non-indigenous Trees—No new or unusual reports resulted from the annual examination of exotic plantations with the exception of a root rot problem in a plantation of hybrid poplars near Terrace and several new host-fungus combinations included under "Other Noteworthy Diseases" below. Twenty-five per cent of the trees in a plantation of hybrid varieties 'Robusta' and 'Grandis' had dead roots and shoots and 75 per cent had basal cankers caused by *Armillaria mellea*. There was a strong suggestion of a site problem, possibly prolonged spring flooding. These same varieties were quite vigorous and free from root rot in the nursery in Terrace from which the diseased trees originated.

Disease Conditions in Forest Nurseries—Late damping-off was at an endemic level at the Quinsam and Green Timbers nurseries. At the Duncan nursery, however, infection levels reached epidemic proportions. In a badly infected bed sampling showed 42 per cent mortality while samples from randomly selected beds showed a loss of 29 per cent.

OTHER NOTEWORTHY DISEASES

Host	Organism	Locality	Remarks
Alder, Sitka.....	*Gnominia setacea* (Pers. ex Fr.) Ces. & de Not.	Dawson, Y.T.	Associated with tip blight of branches.
	Mycosphaerella punctiformis (Pers.) Schroet.	Haines Highway, B.C.	Associated with tip blight of branches.
	Mycosphaerella sp.	Dawson, Y.T.	An unidentified parasite close to *Sphaerella alni* (Cooke) Sacc., apparently causing tip blight of branches.
Birch, European.....	*Melampsoridium betulinum* (Fr.) Kleb.	Yarrow	Heavy infection of leaves of young trees in nursery; probably the first record of this rust disease on *Betula pendula* Roth. in North America.
Comandra, northern.	Virus	Teslin Lake, Y.T.	Common throughout the area; may be a factor in comandra blister rust control, northern comandra being the principal telial host of *Cronartium comandrae* Peck in the Yukon.
Fir, Douglas	*Trichothecium roseum* (Pers.) Link	Duncan	Causing pink mould on cones stored at the forest nursery.
Fir, grand.....	*Darluca filum* (Biv.-Bern. ex Fr.) Cast. and *Tuberculina persicina* Sacc.	Union Bay	Well known parasites inhibiting the spore formation of rust fungi; believed to be the first record of parasitism on the rust fungus *Peridermium pseudo-balsameum* (Diet. & Holw.) Arth. & Kern.
	Odontia bicolor (Alb. & Schw. ex Fr.) Bres.	Victoria	". . . the cause of an important butt rot in various species of coniferous and broadleaved trees in Canada." (Can. J. Bot. 31, 745-749. 1953.) First record on grand fir.
	Pholiota aurivella Fr.	Langford	Causing trunk rot; new record on conifer.
Hemlock, western....	*Flammula alnicola* (Fr.) Quél.	Terrace	Isolated in pure culture from wood rot.

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OTHER NOTEWORTHY DISEASES—Continued

Host	Organism	Locality	Remarks
Labrador tea (Ledum spp.)	*Chrysomyxa woroninii* Tranz.	Fort Nelson, B.C., Dawson, Y.T., and Dawson Junction, Alaska	Causing witches' brooms of Labrador tea and shoot rust of spruce; new host records for British Columbia and Yukon Territory.
Maple, Douglas.....	*Taphrina darkeri* Mix	Cordova Bay	Causing leaf-blisters and -necrosis; first record of its occurrence on Douglas maple.
Oak, Garry.....	*Taphrina caerulescens* (Desm.) Tulasne	Langford	Causing leaf-blisters and -necrosis; first record of its occurrence on Garry oak, although 44 other species of oak are listed as hosts occurring in Japan, Europe, and North America by A. J. Mix.
Pine, Scots.....	*Ganoderma applanatum* (Pers. ex Wallr.) Pat.	Haney	Causing white mottled rot; first host record for North America.
Poplar, balsam.....	*Fomes fomentarius* (L. ex Fr.) Kickx	Fort Nelson	Causing white mottled rot; believed to be the first published record of its occurrence on balsam poplar.
Poplar, hybrid (*P.* X *canadensis* 'Grandis')	*Armillaria mellea* (Vahl ex Fr.) Quél.	Exstew	Causing root rot in plantations; black cottonwood not affected.
Poplar, hybrid (*P.* X *canadensis* 'Robusta Bachelieri')	*Taphrina populina* Fr.	Vancouver (Univ. of B.C. forest)	Causing yellow leaf-blisters and -necrosis; previously reported on *Populus nigra*, and varieties 'Grandis' and 'Regenerata' of *P.* X *canadensis*.
Spruce, Engelmann..	*Arceuthobium campylopodum* Engelm. f. *laricis* (Piper) Gill	Fauquier	Lower branches of tree infected from mistletoe in an overstory of western larch; first herbarium record.
Spruce, white.....	*Flammula alnicola* (Fr.) Quél.	Summit Lake	Isolated in pure culture from wood rot; new herbarium record.
Willow.....	*Trametes odora* (Sommerf. ex Fr.) Fr.	Cinema, Isle St. Pierre, Myrdale, Quesnel	Causing trunk- and butt rot of living, mature trees; often mistaken for *T. suaveolens* (L. ex Fr.) Fr. New record for western Canada.

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